

RADIOLOGY

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No. 1

SOME PRACTICAL CONSIDERATIONS IN THE APPLICATION OF DEEP ROENTGEN THERAPY TO THE TREATMENT OF MALIGNANT DISEASE¹

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BEFORE beginning my paper I wish to take the opportunity to express my appreciation of the honor extended to me in having been asked to deliver a paper before so distinguished a society. It was only with reluctance that I accepted the invitation, for I have nothing new or startling to present to you. However, I will try to describe to you the methods which we have found of practical value in the treatment of malignant disease at the State Institute at Buffalo.

1. THEORIES OF ACTION

Let us first consider briefly the theories of action. These may be summarized as:

(1) Ionization, photochemical, or physical theory. This hypothesis assumes the collision of rays with the atomic cell structure, resulting in the formation of beta and secondary gamma rays and, perhaps, some unknown biochemical modification of the protoplasm.

(2) Thermochemical action, as exemplified by the point heat theory of Desauver.

(3) Discharge action in which absorbed radiation serves to neutralize or discharge excessive accumulated tissue charge. In this connection may be mentioned the "Bipolar Theory of Cancer" and

capacity measurements of malignant tissue before and after radiation, as practised by Crile and his co-workers.

More latent actions in animal tissue are capillary thrombosis (Woglorz) and disturbance of vascular supply with fibroid changes (Ewing). These latter changes may be classified as the reaction of the healthy tissue surrounding the tumor process. Other important clinical effects are lowered salt content of the urine (Cori and Pucher), primary alkalosis followed by secondary acidosis (Myers), increased coagulability of the blood and depressor action on blood pressure.

Whether the effect is entirely caustic, as suggested by Wood, or is selective in addition to its caustic action, as suggested by Ewing and Régaud, remains for future researches to determine.

2. DOSAGE MEASUREMENTS

It is essential to work with iso-dose curves for all deep roentgen-ray settings, also for all types of radium containers and packs. Only by so doing can roentgen-ray and radium dosage be properly correlated, so that the dose delivered to the tumor will adequately cope with the clinical situation and do no harm to the surrounding tissues (Tables I to V).

It has been our custom to consider the gamma ray of radium and the X-ray as

¹ Read before the New York Roentgen Society, January 11, 1926.

having practically similar properties and actions. In fact, we use them more or less interchangeably, as in the case of the radium pack with a filtration of 2 mm. brass and 1 mm. aluminum and an erythema

20×20 cm., and a longer skin target distance, probably not exceeding 80 cm. Such an arrangement will, as I shall show by tables later on, at least for ordinary sized pelvis, give a dose in the tumor of 85 per

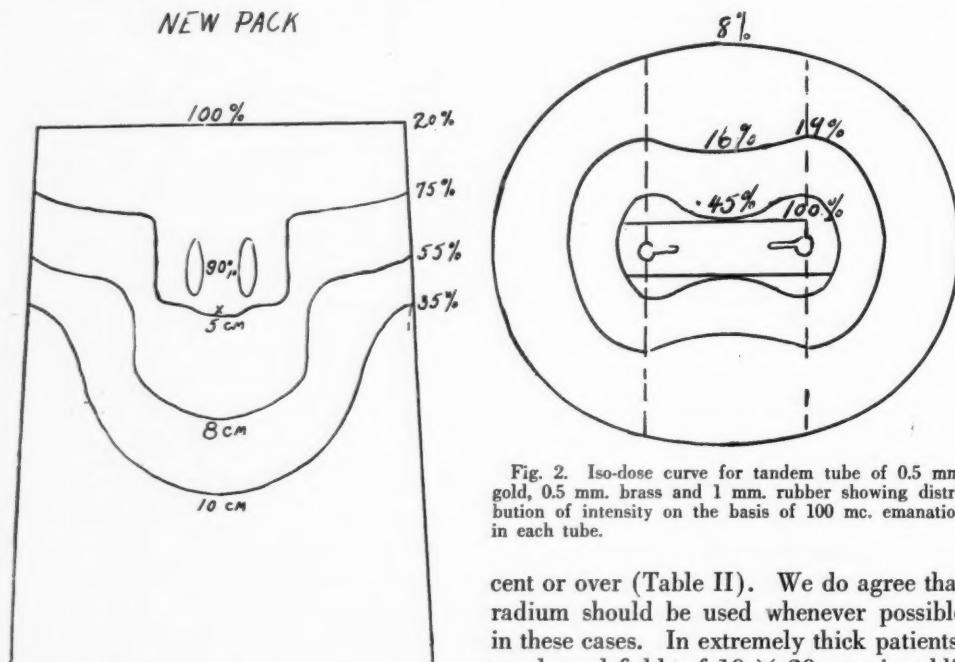


Fig. 1. Iso-dose curve for radium pack with 2 mm. brass and 1 mm. aluminum filter.

time of 22,000 mc. hours (Figs. 1 and 2). This is practically a deep roentgen substitute and has the advantage of being smaller and somewhat more flexible in adjustment.

An occasional roentgen therapist will be found who does not believe in the possibility of delivering a dose of 85 to 100 per cent X-radiation into a deeply seated tumor, as, for instance, cancer of the uterus, but, so far as I am aware, most American physicists are in general agreement on the iso-dose measurements; in fact, the measurement as made by different competent physicists using the same methods shows only slight variations. It is our experience that the difficulties of delivering a fair dose of X-radiation to such tumors can be overcome by the use of a large field, *viz.*, of

Fig. 2. Iso-dose curve for tandem tube of 0.5 mm. gold, 0.5 mm. brass and 1 mm. rubber showing distribution of intensity on the basis of 100 mc. emanation in each tube.

cent or over (Table II). We do agree that radium should be used whenever possible in these cases. In extremely thick patients, two lateral fields of 10×20 cm., in addition to the anterior and posterior fields, should be applied, especially if no radium has been administered. Such procedures will also increase the X-ray dosage in the tumor.

I recognize that this has raised a more or less academic question which involves standardization of dosage measurements by physicists, *i.e.*, size of the ionization chamber and position of the same in regard to the skin line; but I feel assured that the general agreement of most physicists on the iso-dose measurements has to be duly considered before drawing any hasty conclusions. All this emphasizes the necessity of the co-operation of a competent physicist, to standardize and remeasure at intervals all deep roentgen apparatus, and it is hoped that the Standardization Committee will soon give us a standard erythema dose

MATTICK: APPLICATION OF DEEP ROENTGEN THERAPY

in order that we may all speak more intelligibly about dosage. Here it may be fitting to mention that our erythema corresponds to the German erythema of about 1,500 *R*, as distinguished from the French erythema of 4,500 *R*, as compared by Kaplan. This erythema has been amply checked in our clinical practice, and, while we use a dose of 20 to 25 per cent less for children, we have found but slight variation in adult reactions.

No doubt many have recognized the need for a written roentgen prescription. I believe this is very essential for good work. On such prescription forms should be written, after careful examination of the patient and consultation with the radiologist, all the essential machine settings, *i.e.*, skin target distance, field area, time, radium dosage (if used), and any other pertinent data. Our technicians set up the treatments with the aid of such prescriptions under the supervision of the roentgenotherapist, and stamp the starting and finishing time on the back of these forms by means of a standard time stamping clock, besides accurately accounting for the seconds by the simultaneous use of a stop watch. Such practices, we believe, inculcate carefulness on the part of the technicians, besides fixing responsibility and making permanent records of the actual treatment time (Fig. 3).

3. DOSAGE FACTORS

It is our custom to maintain a kilovoltage of 200 K.V., filtration of 0.5 mm. copper, and milliamperage of either 8 or 30 as constant factors in treatment, thus varying dosage by making time and skin target distance variable to suit the best needs of the patient treated.

As a means of maintaining a constant voltage of 200 K.V., under varying atmospheric conditions of temperature and pressure, we have used a simplified method of making such

No.	Name—Doe, Mrs. Anna Region treated—Epithelioma (mucous membrane) cervix. Group I.											
Radium mc. hrs—												
2 Tubes, 2,263.												
Seeds—0.												
Weight—lbs., 174.												
Diameter—cm., 23.												
Treatment No. 1-2.												
Date	Ma.	Diagr.	Skin Area									
1925	10-26	30	Anterior pelvis									
1925	10-26	30	Posterior pelvis									
1925	10-28	30	Anterior pelvis									
1925	10-30	30	Posterior pelvis									
1925	11-2	30										

Fig. 3. Roentgen prescription.

corrections by determining the spark-over voltage on the standard 125 mm. brass sphere gap, as accepted by the American Institute of Electrical Engineers. Such method has been formulated by Stenstrom, who has arranged a table so that, knowing the pressure in millimeters of mercury and the temperature in degrees centigrade, the actual separation of the brass sphere gap can be accurately set for 200 K.V. by means of an inside micrometer. Such spark-over voltage should be carefully checked with the voltmeter readings every week or so, also after any repairs on the rectifying device. Once the voltmeters are so calibrated there should be little change in the readings corresponding to 200 K.V. at different observations (Table VII).

I believe that the permanent installation of the filter (0.5 mm. copper) will tend to prevent catastrophe.

As a means of maintaining constant milliamperage we have found that the constant observation and regulation of the same by the technician with the filament control is preferable to stabilizers. These we have not found to perform satisfactorily with high voltage.

Our work of late has been practically limited to the use of 8 ma. and 50 ma. Coolidge tubes. We recognize no essential difference in the biological actions of these two types except in the proportionate treatment time. With 8 ma. tubes under the best conditions of cooling that we have been able to arrange, that is, the tubes open in the tube stand and cooled by compressed air in conjunction with an electric fan directed on the anode, we have secured an average life from sixteen tubes of 98½ hours of use per tube, the shortest being 2 hours and 48 minutes, and the longest being 451 hours and 41 minutes. To give our present averages for the 50 ma. tube would be unfair to the manufacturer, as many of our original difficulties were due to improper operation of the cooling devices and faulty rectification. After these conditions were recognized and remedied

the tube life was very much increased. With proper rectification and cooling by delivering at least six to seven quarts of water at 50-60 degrees F. per minute, we believe that most of these tubes should run 300 hours at 30 milliamperes. In using these two types of tubes we have found the water-cooled tube to be hardly as flexible as the 8 ma. tube. Where great flexibility or short target distance is required we generally use the 8 ma. tube in a flexible type of tube stand; thus we can treat as close as 30 cm., if desired.

We have adopted skin target distances varying from 30 cm. to 80 cm. as practical and thereby get a range of depth dosage for a 10 × 15 cm. field from 29 per cent for 30 cm. S.T.D.; through 34 per cent for 50 cm. S.T.D.; to 43 per cent for 80 cm. S.T.D. With a field of 20 × 20 cm. at 80 cm. S.T.D. and a depth dose of 49 per cent, an erythema time of 30 minutes with the 30 ma. tube is not an excessive treatment time. To minimize time in the arrangement of treatments we long ago adopted the use of lead-lined treatment cones of assorted field and skin target sizes. For the same reason, we use measuring rods of lengths varying from 30 to 80 cm. S.T.D., measuring from the filter.

Another factor governing dosage, which has sometimes in the past been ignored, is field size or area of skin surface treated. Here the erythema time, due to differences in scattering, varies inversely as the size of the field. A curve constructed by Stenstrom and agreeing with one by Bachem has been found useful in reckoning this factor, and is constantly used by us.

In this same connection should be mentioned the use of some media to properly assure accurate dosage when radiating two or more opposing fields. We have experimented in the past with several such materials as rubber bags filled with water, a German preparation of a wax-like nature called "radioplastin," and a mixture of one-third china clay and two-thirds wheat flour sewed up in bags of assorted sizes made from a light rubber sheeting material.

TABLE I

To figure dosage in per cent at 3 cms. from emanations.

For:

1 tube: multiply mc. hr. by06
 2 tubes: multiply mc. hr. by (.08 + 2) or04
 (See curve of distribution)
 Seeds: multiply mc. hr. by (.6 × .05) or03
 All filtration of emanation tubes consists of
 0.5 mm. gold, 0.5 mm. brass and 1 mm. rubber.

The latter has been found the most practical. This is designated with us by the name of "bolus." With such bags it is possible to accurately build up the part treated so as to fulfill the theoretical assumptions of scattering in a media having approximately the same coefficient of absorption as the human body. By the use of such "bolus," dosage by two parallel opposite fields can be made very homogeneous and accurate.

In regard to the question of protection of the patient, it is needless to say that all apparatus should be grounded to protect against electrical shocks. To protect the body from X-ray exposure, a built-in tube holder surrounded by heavy lead, while probably less flexible, surely obviates the necessity of weighing down the patient with protective lead rubber as is usual in treating with tubes run open.

TABLE II

Two fields opposite each other
 200 K.V. 0.5 mm. Cu. 80 cm. S.T.D. 20 × 20 cm. field

Diam.	100% on field		100% on skin	
	Skin	Center	Field	Center
16 cm.	122	119	82	98.5
17	120	114	83.5	95
18	118	107	85	91
19	117	103	86	88
20	115	98	87	85
21	114	93	88	82
22	112	88	89.5	79
23	110	84	91	76.5
24	109	81	92	74
25	108	77	93	71.5
26	107	74	93.5	69
27	106	70	94.5	66
28	105	66	95.5	63
29	104	63	96	60.5
30	103	60	97	58

NOTE: This and succeeding similar tables were constructed from iso-dose curve. To use the same, ascertain diameter of the part by careful measurement. Opposite the figures corresponding with this diameter read the skin and tumor dose resulting from 100 per cent incident radiation on each side.

4. MASSIVE versus DIVIDED DOSAGE

As is well known, the German technic, which was so much heralded after the recent war, was based on massive carcinoma or sarcoma doses, administered in one sitting. Such treatments were often like sledge-hammer blows to our patients. They were commonly on the table twelve or more hours, undergoing treatment for cervical

TABLE III

Two fields opposite each other

200 K.V. 0.5 mm. Cu. filter Eff. wave length = 0.16 Å 10 × 15 field

Diam. cm.	80 cm. S.T.D.		70 cm. S.T.D.		Diam. cm.
	100% on field Skin	100% on field Center	100% on skin Field	100% on skin Center	
10	133	146	75	110	131
11	130	139	77	107	128
12	127	133	79	105	125
13	124	125	81	101	122
14	122	118	82	97	120
15	119	113	84	95	118
16	117	106	85	90	115
17	116	100	86	86	113
18	114	96	88	84	111
19	112	90	89	80	110
20	111	85	90	77	108
21	110	80	91	73	107
22	109	77	92	71	106
23	108	73	93	68	105
24	107	69	94	65	104
25	106	65	94	61	103

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TABLE IV
LATERAL FACE, JAW, OR NECK FIELDS

Two fields opposite each other

200 K.V. 0.5 mm. Cu. Eff. wave length = 0.16 \AA 10 \times 15 field

80 cm. S.T.D.						
100% on field				100% S.E.D.		
Diam. Cm.	Surface S.E.D.	Center Dose	Dose $\frac{1}{3}$ from surface	On field	Center Dose	Dose $\frac{1}{3}$ from surface
10	133	146	150	75	110	113
11	130	139	143	77	107	110
12	127	133	136	79	104	107
13	124	125	127	81	101	103
14	122	118	123	82	97	102
15	119	113	119	84	95	101

TABLE V
Two fields opposite each other
200 K.V. 0.5 mm. Cu. filter Eff. wave length = 0.16 \AA

50 cm. S.T.D. 10 \times 15 cm. field						
Diam. cm.	Skin	100% on field Center	Tonsil	Field	100% on skin Center	Tonsil
8	135	142	144	74	105	107
9	131	133	135	76	101	103
10	127	128	130	79	101	103
11	123	119	121	81	97	98
12	121	114	116	83	95	96
13	118	105	107	85	89	91
14	116	98	101	86	84	87
15	114	92	96	88	81	84.5
16	112	87	91	89	77	81

TABLE VI
200 K.V. 0.47 mm. Cu. filter 30 ma.

Field	Time for Skin Erythema			Dose in Minutes		
	40 cm.	50 cm.	60 cm.	70 cm.	80 cm.	100 cm.
3x 3	9.8	15.9	23.5	32.7	43.0	67.0
6x 8	9.0	14.3	21.4	29.6	39.0	61.0
8x10	8.2	13.5	20.0	27.7	36.5	57.0
10x15	7.5	12.2	18.1	25.0	33.0	51.5
15x20		11.2	16.7	23.2	30.5	47.5
20x25			16.5	22.7	30.0	47.0

200 K.V. 0.5 mm. Cu. filter 8 ma.						
Field cm.	Time for Skin Erythema	30 cm.	40 cm.	50 cm.	60 cm.	Dose in Minutes
		70 cm.	80 cm.	45 cm.		
3x 3	18.9	34.5	55.0	79.9	109.9	145
6x 8	16.6	30.5	48.5	70.5	97.0	128
8x10	15.7	28.8	45.9	66.7	91.7	121
10x15	14.3	26.1	41.5	60.3	83.0	109.5
10x20	13.7	25.1	40.0	58.2	80.0	105.5
15x20	13.3	24.2	38.7	56.1	77.3	102
20x20	13	23.9	38.1	55.4	76.2	100.5
20x25	13	23.8	37.9	55.1	75.8	100

NOTE: Erythema times in accordance with field area and skin target distance for both the 30 ma. and 8 ma. tube technic.

TABLE VII

SPHERE GAP SPARK — OVER VOLTAGE

At 25°C. and 741 mm. barometric pressure (Buffalo)
Sparking distance in mm. between 125 mm. spheres (both grounded)

Crest K.V.	Mm. spark	Correction factor of K.V. for 5°C., 1.017 Correction factor of K.V. for 10 mm. Hg., 1.013.	25°C. mm. spark	200 K.V. Temp.	741 mm. pr. mm. spark
40	13.8				
55	18.9	200 K.V. mm. pr.			
70	24.5		25°C. mm. spark	200 K.V. Temp.	
85	30.7				
100	37.5	770	87.0	15°C.	87.4
120	46.6	760	89.0	20	90.2
140	56.5	750	91.1	25	93.0
160	67.3	740	93.2	30	95.8
180	79.0	730	95.3	35	98.6
200	93.0	720	97.5		
		710	99.7	Diff. for 5°C. = 2.8 mm. sp.	
220	109.3				
240	129.5	Diff. for 10 mm. pr. = 2.1 mm. sp.			

NOTE: Spark gap settings are figured from the above table, prepared by Stenstrom (*Acta Radiologica*, Vol. III, Fasc. 2-3, 1924, p. 167) by making corrections for variation in temperature from the standard 25°C. by computing on the basis of 2.8 mm. spark gap change for each 5°C. variation or fraction thereof and for pressure other than the standard 741 mm. on the basis of 2.1 mm. spark gap change for each 10 mm. variation or fraction thereof.

carcinoma. During those days we used to put the patients on the table and hand them an emesis basin. They often wondered why they were given this basin, but generally found out in the course of an hour or so. Such treatment methods had their advocates in the persons of Wintz, Seitz, Holfelder and many others. Analysis of the results of massive dosage has greatly changed the opinion of many. On reviewing the literature two years ago, I found Holzknecht suggesting two doses following each other at short intervals. He believed the interval could best be judged by the fact that no cell division takes place in the first three days after radiation.

Opitz and Schnitz believed in applying large doses of 1.5 to 2 skin units only to small circumscribed tumors, and for others favored small divided doses.

Schwarz recalled drawing attention, in 1914, to the increased radio-sensitivity of cells undergoing mitosis, and has accumulated much evidence since to substantiate this point. On this basis he recommends the following methods: In sarcoma and lymphosarcoma divided doses ten days apart; in carcinoma three-day intervals, applying the relatively larger dose first.

Jüngling believed prophylactic radiations to give best results in mammary carcinoma when given in divided doses. Lehmann, in 1920, applied the massive dose method in prophylactic irradiation of mammary carcinoma and found as many recurrences in the first three years as amongst the unirradiated. He next divided the dosage and found fewer early recurrences but more after the three-year period in this latter group than in the comparable unirradiated group. Larson also reported similar experience.

Perthes, in 1920, in discussing results of radiation of mammary carcinoma, noted increases in the number of recurrences after massive post-operative radiation. This aroused interest throughout Germany and there was a general confirmation of these results. Recently, Portmann, of the Cleveland Clinic, has compiled these statistics, especially the reports of Perthes, Tichy, Loosen and Kastner, in tabulated form which shows to nice advantage this tendency of mammary carcinoma to increased recurrence after massive post-operative irradiation.

Régaud also advocated divided dosage and reported very brilliant results, especially in epithelioma of the larynx.

With the idea of formulating a definite scheme of dosage under the divided dose technic, I radiated the breasts of several patients, applying 100 per cent on one area and four doses of 30 per cent each on an adjoining area of similar size, administered every other day for a week. These experiments were repeated, giving four to six doses aggregating 140 to 150 per cent in ten days and two weeks, respectively. It was found that the erythema produced by the massive dose of 100 per cent was equal to the erythema produced by 130 per cent in one week, or 140 per cent in ten days or 150 per cent in two weeks. Thus it is possible to give these amounts in divided doses and bring the X-ray absorption of the part to a "point of saturation." We have rechecked the observations on many occasions by clinical experience in hundreds of cases, so that they now form an accepted standard for our technic of divided dosage. We are now conducting experiments aimed to keep a constant 90 to 100 per cent of irradiation in the tumors over a time of three to four weeks, by making up the tissue losses due to time, by small doses equal to this loss. It is too early, however, to speak of the results.

To-day, the case of divided *versus* massive dosage seems pretty much settled, for the present at least, in favor of the former. In 1924, I changed from our previous system of massive dosage to the divided technic in an attempt to improve the final results. To-day, nobody on our staff would favor a return to the older massive method. Not only have results been decidedly more encouraging, but the patients' resistance has been conserved. They have very little severe radiation illness, comparatively milder skin reactions, and more opportunity for psychic encouragement.

In an attempt to reduce irradiation sickness to a minimum, I would stress the use of the smallest field consistent with good results and the shortest exposure time. The former helps keep down the body dose and the latter tends to prevent undue psychic irritation from the treatments. A recent

survey of two hundred treatments given by us disclosed the fact that, whereas the former major symptoms of radiation sickness had been reduced to an almost negligible minimum by our present technic, still there was a certain minor residuum. Thus, I found amongst two hundred treatments the following symptoms present in the following percentages in mild degrees:

Nausea	34.5%
Malaise	33 %
Headache	22 %
Salivation	9.5%
Vomiting	8 %
Chills	8.5%
Diarrhea	7 %
Fever	4 %

Women were more prone to these minor symptoms than the men by about a 10 per cent margin. A more detailed report is in course of preparation.

5. METHODS

Methods in deep roentgen therapy are probably as varied and numerous as the roentgenotherapists themselves. Each has his pet method and no doubt all hope for some possible standardization.

Methods may be classified into: (1) those useful in lesions at or near the surface; and (2) those directed at lesions in the interior of the body.

The first group are among the lesions most amenable to roentgen therapy and here can be included single field methods and treatment of lesions requiring moderate or light dosage, as lymphosarcoma (60 to 70 per cent), Hodgkin's disease (60 to 70 per cent), and leukemias (30 to 40 per cent).

There is a large group of lesions situated relatively near the surface with which success has not been so outstanding, namely, mammary carcinoma. It is generally conceded that the most approved treatment in early operable cases is radical amputation, in conjunction with post-operative and sometimes pre-operative roentgen therapy.

Our early method of treatment of carcinoma of the breast consisted in the application of several small fields anteriorly and

posteriorly over the chest of the affected side with 140 peak K.V. and aluminum filters. Later we changed to the copper-filtered massive dose German method, as was in vogue after the war. This consisted in applying cross-fire radiation at 80 cm. S.T.D., both anteriorly and posteriorly over the affected side, sufficient to produce a first degree burn. Such treatment was very severe and did not seem to achieve the desired results even in conjunction with radium seed implantation; besides also spending the brunt of the radiation on the innocent lung and pleura, as the frequent reports of pneumofibrosis testified. It was hard to forsake this time-honored treatment from the Continent, but after consultation I found my confrères were as willing to see a change in technic as myself. Therefore, about a year and a half ago I returned to the older idea of one or more fields of copper-filtered radiation at a moderate skin target distance of 45 cm. over the anterior chest, axilla and supraclavicular area. Such technic administers a dosage to the breast tumor as high as was possible with the older method, besides lending itself to divided technic over one week to ten days, in which time 130 to 140 per cent may be given in four to six short séances. Such fields are applied with the patient lying in the oblique position with the shoulder of the diseased side partly elevated on a pillow, thus giving a wide exposure of the breast, axilla and supraclavicular region. It is too early to determine ultimate results, but, so far, we have not seen the tendency to recurrence as we did after the previous massive dose technic. We also believe our results to be materially better. We have seen striking early results in some inoperable breast carcinomata by this divided technic, and have every reason to believe that such method is a forward step in the handling of this group.

In accordance with the report of Lee and Herendeen we hope to be able to revise our experiences on wound-healing after pre-operative radiation, as we believe this a

legitimate procedure in increasing end-results.

Two opposite parallel field cross-fire methods are used by us for radiation of the cervix, body of uterus, rectum, prostate, bladder, vagina, etc., in conjunction with radium, applied locally by seeds or tubes or both. For such treatments we apply large fields 20×24 cm. over the symphysis pubis and sacrum and arrange dosage so that by divided technic we do not exceed 135 to 140 per cent three centimeters from the radium tubes, thus avoiding injury to the surrounding structures. These roentgen treatments generally follow the day after the radium therapy and are repeated by administering a field every day till the whole dose is given.

In July, 1924, I put into use a series of dosage tables devised for the purpose of simplifying dosage measurements in treating two opposite parallel fields by the cross-fire method. These tables are based on careful measurements with iso-dose curves and were devised by me to obviate the cumbersome repetition of measurements by means of these curves in every individual case where such treatment was advisable. In treating epithelioma of the cervix, with these charts (Table II) it is only necessary to find the thickness of the part treated in centimeters and opposite this measurement to read off the skin erythema and the tumor dose on the basis of 100 per cent incident ray. The great time saved by the use of such tables is at once apparent. Radium dosage is correlated in proportion (Fig. 2, Table II). Similar tables (Tables III, IV, V) were also constructed for treating lesions of the mediastinum, esophagus, tongue, tonsils, floor of mouth, larynx, etc., and are easily correlated with radium dosages administered. The localizations of the parts treated in using these tables were based on the anatomical cross-sections of Eycleshymer and Schoemaker.

Where it is necessary to use more than two fields by cross-fire methods, measurements made with the iso-dose curves or the field selector of Holfelder seem always

advisable, applied to an exact diagram of part treated.

Among the special methods that have proven valuable, besides the above, may be mentioned the following:

The Three Triangular Field Method for radiation of localized tumors two to three centimeters under the surface of the skin, as described by Stenstrom, Mattick and Schreiner. By this method it is possible to get a 120 to 130 per cent dose into such a tumor without damage to the overlying skin. Such treatment must be administered in one séance and does not lend itself to divided dose technic.

Another useful method, especially for tumors about the knee and elbow joints, is one known to us as the Triangular Box Method. It consists in placing the patient's extremity in a triangular box which fits like a cuff around the involved joint or part. Bolus is stuffed between the part and the box, completely filling the same, and the three faces of this box are radiated. By this method, working at 50 cm. S.T.D. and not exceeding 80 per cent of incident radiation on each face of the box, it is possible to get a homogeneous radiation into the part with a higher dose in the center than can be secured by parallel opposite fields. This treatment also does not lend itself to divided dose technic. It has proven useful especially in radiating giant-cell tumors of these structures. From the X-ray plates of at least three cases so treated, Bloodgood has recently demonstrated the first bone regeneration he claims ever to have seen in these tumors as a result of X-radiation.

No doubt most of us have been dissatisfied with our methods of radiating tumors of the epigastrum, especially carcinoma of the pylorus. I devised a method about two years ago that gives a sufficient dose into the tumor without endangering the patient by extreme radiation sickness and injuries to the bases of the lungs, adrenals, spleen, etc. A somewhat similar method had been described by Holfelder, but this appears to me to be objectionable because

it seems difficult to avoid deleterious effects on the bases of the lungs and adrenals. After some preliminary observations, on the cadaver, I decided it was possible to localize a dose of 95 to 105 per cent into the pyloric area and also to avoid damage to the above mentioned vital structures by applying three fields of 10×15 cm. at 80 cm. S.T.D., one anterior directed caudad at an angle of about 70 degrees to the body axis, the other two fields applied at an angle of about 120 degrees from the axial ray of the previous field, and of the same size over the flanks, directed in the same plane at an angle of 70 degrees cephalad, all converging about the region of the pylorus. We have used this method on every available case of this type and feel that it has added much in the way of palliation to these poor unfortunates. Most patients after such radiation have maintained a good body weight and have been relatively free from vomiting and pain, besides being tided along for about a year or so after being referred to us as inoperable hopeless cases with little time to live. Such treatments can be very conveniently given by divided doses.

6. RESULTS

In the Fall of 1920 the State purchased for our use 2 grams of radium, and the following Fall of 1921 our first deep roentgen apparatus was installed; therefore, many of our better results are based on the period from 1922 to date. I will attempt only to summarize the results as published by various members of our staff, especially from a recent summary by Schreiner, which is to appear in an early issue of the *Acta Radiologica*.

In Hodgkin's disease and leukemias, we have been able to achieve great symptomatic relief and prolongation of life, but no cures.

In localized lymphosarcoma with regional nodes only involved, apparent clinical healing occurred in 13 out of 38 cases for a period of three months to six years;

in diffuse lymphosarcoma, marked palliation but no cures resulted.

Basal cell epithelioma not involving bone, cartilage or fascia has yielded to massive doses of unfiltered X-ray in 95 per cent of 425 cases, with clinical healing ranging from several months to many years. Approximately 75 per cent are permanently healed (Schreiner, Simpson and Mueller).

Cancer of the lip in 216 cases responded in the following percentages:

Group I.	52% early cases, well over 5 years. 78% early cases, well over 3 years.
Group II.	30% with lymphatic involvement but still operable, well 5 years. 39% with lymphatic involvement but still operable, well 3 years.
Group III.	0% inoperable cases with fixed metastasis, ulceration or involvement of the periosteum, clinically well.

These lip cases were mostly treated with unfiltered X-ray or radium locally and high-powered X-ray over the lymph drainage areas of the neck.

Epithelioma of the oral cavity, treated by seeds and deep roentgen ray, has yielded clinical healings in percentages ranging from 5 per cent for advanced lesions with metastasis to 29 per cent for early lesions. Involvement of cheek, upper jaw and gums yielded the best prognosis and healed in as high as 50 per cent of the early cases. In this group there were 375 cases and the above percentages represent those clinically well to date.

Of 23 early cases of epithelioma of the antrum, 5 have been clinically well from one year to eight and a half years.

Epithelioma of the penis by pre-operative radiation with unfiltered X-ray, followed by radical amputation with dissection of the glands of the groins and followed by post-operative deep roentgen therapy over the groins, will often give good results where there is no clinical metastasis. Institute records, as reported by Schreiner, show healing from two to ten years in 7 out of 13 early cases; and from one to seven years in 4 out of 24 farther advanced cases.

Of 31 cases of epithelioma of the vulva and clitoris, treated by radium seeds followed by coagulation in one to four months and post-operative deep radiation over the groins, 4 cases are clinically well from one year three months to two years five months.

Of 8 cases of epithelioma of the vagina, treated with radium tubes against the lesion supplemented by deep X-ray, 4 remain clinically well from two months to two years and eight months where the lesion is early and localized, and 2 out of 25 far advanced cases have remained well for one year and seven months and three years, respectively.

In adenocarcinoma of the rectum we favor the use of radium seeds or tubes followed by deep X-ray. In 184 cases, 11 have remained healed from eight months to four years. Schreiner does not favor colostomy unless absolutely necessary.

Epithelioma of the cervix has yielded excellent results. Out of the first 368 cases treated at the Institute to January, 1924, the following percentages by groups are alive and well from two to five years:

I	II	III	IV	Total
80%	40.7%	14.4%	Palliation only to 4 years.	10.8%

(Revised from report by Schreiner.)

Adenocarcinoma of the cervix remained healed in 57 per cent of operable cases from one year eight months to three years eight months. In inoperable cases we obtained palliation only.

Adenocarcinoma of the fundus of the uterus healed in 9 out of 15 early cases for periods up to three and a half years. In the inoperable group, palliation only was secured. In recurrent cases after operation, 6 out of 20 cases have been clinically well from a few months to three years.

Amongst the malignant conditions of the kidney, we had palliation in 2 cases of hypernephroma for two and three years, respectively. A recurrent case of adenocarcinoma of the kidney is well two years after X-ray.

We had 17 cases of carcinoma and 14 cases of papillomatous cyst of the ovary. All were far advanced and we have had palliation only, in several cases up to two and a half years.

Watson, using coagulation followed by radiation, has personally informed me that 10 per cent of all cases of epithelioma of the bladder treated by him at the Institute are alive for three to five years. In prostatic cancer by seeding through the perineum and deep X-ray over the pelvis, he has one case alive and working over five years, but not cured; also many less extended palliations.

Our mammary carcinoma statistics are still in the course of compilation but I have secured from Dr. Anette Stenstrom the following advance information for the left breast lesions for the period from 1914 to October, 1925.

During this time our records for radiation in conjunction with the other commonly used procedures show

3-YEAR RESULTS

(155 Cases)

	Clin. Living	Un- well	Un- known	Dead	Total
Prophylactic	13	8	4	6	23
Group I.....	6	3	0	0	6
Group II.....	8	3	3	5	16
Group III.....	6	3	3	19	28
Group IV.....	5	0	17	60	82

5-YEAR RESULTS

(76 Cases)

	Clin. Living	Un- well	Un- known	Dead	Total
Prophylactic	8	6	4	7	19
Group I.....	2	2	0	0	2
Group II.....	1	0	1	3	5
Group III.....	1	0	1	10	12
Group IV.....	0	0	5	33	38

Thus we have approximately 38 per cent prophylactic and Group I lesions of the left breast clinically well five or more years after radiation. We believe that by our present technic we will secure better results in the future.

Schreiner believes mixed tumors and endotheliomata are best treated by surgical

removal when possible, followed by radiation. When inoperable, he resorts to seeding, followed by high voltage X-ray. Of 41 cases in this group, 11 have remained well for periods varying from six months to five years.

Melanoma without visible metastasis, treated by X-ray or radium, showed healing in 9 of 16 cases for periods ranging from four months to six years and nine months; and 25 per cent of these cases have been healed more than two and a half years.

In cancer of the esophagus, stomach and colon, we have been able to secure palliation only.

Most cases of giant-cell tumor have been subjected to deep X-radiation. By such methods we have spared our patients amputation and restored good function in the limbs. Nine out of 11 cases treated are clinically well and in at least 3 cases X-ray plates show bone regeneration after such treatment.

Twelve out of 21 cases of spindle-cell sarcoma involving the soft tissues are alive and well after radiation, distributed over the years from 1917 to date. All of these cases have been clinically well at least a year.

In the cases of periosteal and osteogenic sarcomas treated by us, the patients are all dead. Metastatic carcinoma of the spine, with cord pressure, has shown remarkable palliation in many cases.

CONCLUSION

In closing I can do no better than to refer to a statement so often repeated by our Director, Dr. Simpson, that to date we are apparently able to satisfactorily treat only 30 per cent or less of all cases of malignancy, and that the remaining 70 per cent all die. It is certain, therefore, that our present methods cannot be the last word; it is sometimes even doubtful whether we are on the right track. However, we have conclusively proven that at least some types of malignancy will respond to radiation and by perfecting methods and applications

we may be able to add to the 30 per cent now cured, or, if not so fortunate, to gain additional knowledge that may finally help in conquering this dreadful scourge.

BIBLIOGRAPHY

1. WOGLOM, WILLIAM H.: Critique of tumor resistance. *Jour. Cancer Research*, 1922, VII, 283.
2. EWING, JAMES: Mode of radiation upon carcinoma. *Am. Jour. Roentgenol. and Rad. Ther.*, June, 1922, IX, 331.
3. CORI, CARL F., and PUCHER, G. W.: Biological reactions of X-rays: effect of radiation on nitrogen and salt metabolism. *Am. Jour. Roentgenol. and Rad. Ther.*, Sept., 1923, X, 738.
4. KAST, L., MYERS, V. C., and SCHMITZ, H. W.: Clinical conditions of alkalosis. *Jour. Am. Med. Assn.*, June 7, 1924, p. 1858.
5. WOOD, FRANCIS CARTER: Immunity in cancer. *Jour. Am. Med. Assn.*, Oct. 3, 1925, p. 1039.
6. RECAUD, CLAUDE: Some biological aspects of radiation therapy of cancer. *Am. Jour. Roentgenol. and Rad. Ther.*, Aug., 1924, XII, 97.
7. KAPLAN, IRA I.: Comparison between French and German "erythema dose" as measured on Solomon iontoquantimeter. *Am. Jour. Roentgenol. and Rad. Ther.*, Nov., 1924, XII, 464.
8. STENSTROM, K. W.: Voltage in roentgen-ray therapy. *Acta Radiologica*, III, Fasc. 2-3, 1924, p. 167.
9. BACHEM, ALBERT: *Principles of X-ray and Radium Dosage*. Chicago, 1923.
10. PORTMANN, U. V.: Rôle of radiation in treatment of cancer of breast. *Radiology*, Oct., 1925, p. 286.
11. LEE, B. J., and HERENDEEN, R. E.: Evaluation of pre-operative and post-operative radiation in treatment of mammary carcinoma. *Ann. Surg.*, Sept., 1925, p. 404.
12. EYCLESHYMER, A. C., and SCHOEMAKER, D. M.: *Cross-section Anatomy*. D. Appleton and Company, New York, 1923.
13. STENSTROM, K. W., MATTICK, W. L., and SCHREINER, B. F.: Practical method for applying X-rays: 120-150 per cent of skin dose to tumor without injury to skin. *Acta Radiologica*, IV, Fasc. 4, 1925, p. 347.
14. SCHREINER, B. F.: Summary of methods and results of treatment of cancer, based on study of 3,246 cases. *Acta Radiologica*, V, March 12, 1926.
15. WATSON, E. M.: Personal communication.
16. SIMPSON, B. T.: Present status of treatment of cancer. *N. Y. St. Jour. Med.*, Nov. 15, 1925, p. 1022.

Hip joint infections. — Acute epiphysitis, acute infectious synovitis and acute arthritis of the hip joint are often used synonymously. Clinically, and roentgenographically, the conditions cannot be differentiated at the onset. In the infant it is a serious complication. The X-ray plays an important part in the diagnosis and to this end a knowledge of the X-ray findings is necessary.

The author's conclusions are as follows:

1. Acute gonococcus infections of the hip joint in the newborn are characterized clinically by early, spontaneous dislocations. Immobilization in plaster casts and diathermia are of definite curative value in preventing destruction and relieving the inflammatory reactions. Reduction of the dislocation should not be attempted during the acute stage. Vaccines have proved valueless.

2. Streptococcus and staphylococcus infections of the hip joint in older children are characterized by severe constitutional and local reactions. Destruction of the joint is induced by unallayed muscle spasm and extension of the disease through contacting pressures. Incision and drainage, extension and fixation relieve symptoms and prevent progressive destruction of the joint. Intravenous therapy has proved of little value.

3. Children who have recovered from the acute infections should be under observation for at least one year. Deformities frequently have to be corrected or pathologic dislocations reduced.

L. R. SANTE, M.D.

Acute Pyogenic Arthritis of the Hip Joint in Infancy and in Childhood. Morris B. Cooperman. *Am. Jour. of Dis. of Child.*, Feb., 1926, p. 183.

COMBINED TREATMENT OF CARCINOMA WITH ROENTGEN RAYS AND INTRAVENOUS INJECTIONS OF DEXTROSE¹

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Translation by HENRY R. WOLCOTT

IN a report presented three months ago to the Wiener Röntgengesellschaft, I gave the first account of my experiments, undertaken in the Holzknecht Institute and the Hajek Clinic, with a view to accentuating the action of roentgen rays on tumors. Biologic and clinical observations, theoretical considerations, and the findings of Freund and Kaminer (1), Russel (2), Warburg (3), and Silberstein (4), all of whom have demonstrated the close relations of tumors to the carbohydrates, led me, in a number of hopeless cases of carcinoma, to give intravenous injections of dextrose along with roentgen rays. My first trials gave such striking results that their continuation with a larger number of cases seemed justified.

The patients were irradiated in our usual manner. Each day a field was chosen and was given a complete dose. In addition, the patients received, before each irradiation, an intravenous injection of 10 c.c. of a 10-50 per cent dextrose solution, usually 33 per cent Osmon,² which can be relied on to contain no albumin. In the case of some patients, the injections were continued for some time after the irradiation. It became apparent later, however, that the injections given at the time of the irradiation were sufficient for the securing of the desired effect, which finding is in agreement with the theoretical assumption that the effect sought is based on a fermentative process which cannot be stimulated beyond a certain degree without allowing the patient a period of rest. The accompanying table will give a survey of the first fifty patients treated in the manner described, all of

whom have been under observation for some time since the treatment.

At the present time, I can, to be sure, report only on early results, for the oldest of my cases have been under observation only four months since the treatment was given. But it is evident that the results are better under the combined treatment with roentgen rays and dextrose injections than with roentgen rays alone. For instance, carcinoma of the tonsil is very frequently refractory. Juengling states very plainly in his book: "Carcinoma of the tonsil we count among the carcinomas that do not yield readily to roentgen-ray treatment." Of the six carcinomas of the tonsil in which I employed the combined treatment only two were refractory, while four were retrogressive within two or three weeks after the first irradiation—some of them strikingly so. And many others behaved in a similar manner, although the table gives only a survey of them. As my time is limited, I must content myself with stating that, to my surprise, even some carcinomas that I had irradiated previously without results, when given several combined treatments, one field each day, with the last or next to the last field, began to show considerable improvement, while several carcinomas (histologically proven cases), and sarcomas that reacted favorably, disappeared entirely, or almost entirely, within a space of from two to three weeks.

Aside from the therapeutic effects, I must mention some other remarkable manifestations. If, in this connection, I confine myself almost exclusively to the rhinolaryngologic cases, that is to be explained by the fact that, during the period of observation, more such cases were at my disposal. It is possible that what I observed concerning

¹ Address delivered at the seventeenth session of the Deutsche Röntgengesellschaft, held in Berlin, April 11, 1926.

² Pharmazeutische Industrie A. G., Vienna I.

the behavior of those carcinomas would apply *mutatis mutandis* equally well to the others, but, in the absence of such observations, I cannot maintain that that is the case.

If reference is made to Table I, it will be noted at once that the tumors of the pharynx, the epipharynx and the hypopharynx yielded readily to the irradiation and that, in some instances, the tumors of the tonsil reacted fairly well, whereas the carcinomas of the larynx and of the epiglottis, of the tongue and of the buccal mucosa could be influenced but rarely and then only to a slight extent. This observation runs in so far parallel to former observations that the former, when no dextrose was used, yielded more readily to treatment than the latter. The new feature, in connection with the combined treatment with roentgen irradiation and dextrose injections, is the distinct character of the contrast between the almost absolute failures on the one hand and the prompt and often permanent beneficial effects on the other. One gets, therefore, the impression that the action of the injections in the way of accelerating and accentuating the effects of the

roentgen rays is the more striking when the carcinoma is naturally susceptible to roentgen rays. However, I must mention as an exception to the rule that "the relative susceptibility of the carcinomas remains the same under the combined treatment that it is when no dextrose is employed," that among the fifty cases listed in the table there are some in which the reaction was favorable, although under former irradiations they had shown themselves to be absolutely refractory.

A further observation, and, as it seems to me, an important one, I will make plain by citing a case in which the observation period has been relatively long. The case in point was a pavement epithelial carcinoma of the epipharynx with an apple-sized hard glandular tumor in the deeper tissues of the right side of the neck and several superficial glands on the left side. The primary tumor disappeared as a result of the irradiations, which extended over a period of ten days. Within the next fourteen days, the large glandular tumor on the right side of the neck also disappeared, while there was only a slight vestige of the

TABLE I

ENUMERATION OF FIRST FIFTY CASES, TOGETHER WITH THE COURSE OF DEVELOPMENT
AFTER COMBINED ROENTGEN-DEXTROSE TREATMENT

Carcinoma of the	Number of cases	Pro-gressive	Status quo ante	Partial improvement ³	Improve-ment in entire clinical picture	Improve-ment in clinical picture, followed by exacerbation
Larynx (no operation).....	9		4	3	2	
Larynx (rec. operation).....	4	3			1	
Tonsil	6	2			2	
Sinus priformis	5		1		2	2
Pharynx	2				2	
Epipharynx	4				3	1
Tongue	3	2	1			
Thyroid (metastasis)	2					
Mouth	2	2				
Epiglottis	2	2				
Soft palate	1		1			
Esophagus	1			1		
Uterus	2					2
Prostate	1				1	
Bladder	2				2	
Stomach	4		2	2		
Total	50	11	9	6	17	7
Percentage of results.....		22	18	12	34	14

³ (a) Subjective improvement without demonstrable change in clinical findings; (b) Partial improvement of the clinical findings without improvement in the entire clinical picture.

superficial and most recent glandular manifestations on the left. However, immediately following the irradiations there arose in the intensively irradiated field on the right side of the neck a new superficial gland that was enlarging rather rapidly. After an interval of five weeks, the second series of irradiations was carried out, whereupon the superficial glands on the left side of the neck disappeared in a short time, while the new gland on the right retrogressed very slowly and finally disappeared. The impression was unavoidable that the relative susceptibility of the foci to the roentgen rays was dependent on the age of the tumors. I made similar observations in other cases. For instance, it was noted that in one and the same field, which had been irradiated equally well throughout, certain metastatic glands had retrogressed considerably in a few days, while others continued to enlarge and did not begin to recede for several weeks, although they then retrogressed without further irradiation; occasionally, however, new ones developed in the meantime. If, in view of the hopelessness of such a case, the roentgenologist is tempted to irradiate these very recent metastases that develop following the irradiation of the principal field, he will soon become convinced that they are absolutely refractory and, in this stage, cannot be checked in their growth by any amount of irradiation. In other words, what responds to treatment responds readily; forcing is of no avail. On the basis of these observations, we are compelled to assume that metastases of a carcinoma susceptible to roentgen-ray treatment are absolutely refractory in their first stage of development, but later become gradually highly susceptible to treatment, and, in a final stage, as has been known for some time, are inclined merely to shrivel slightly and become soft when subjected to irradiation. Similar behavior was observed occasionally also in the primary tumor itself. The cause of this variation in susceptibility

is unknown to me at the present time. In any event, I see no justification for connecting such behavior with mitosis. The finding points rather to the correctness of the view advanced by several, and more particularly by Gottwald Schwarz (5), that the susceptibility of a carcinoma in various stages of its development is dependent chiefly, not on the opulence of mitoses, but on other conditions. In consequence of the variability in the reaction, the proper timing of the irradiations constitutes a problem in itself, which has just begun to be studied on the basis of these observations.

In closing, I would like to say a few words about an essential point in connection with irradiation. Stejskal and Latzel discovered that injections of hypertonic dextrose solutions cause latent inflammations to flare up for a short time. This offers an explanation for the fact that in my patients occasionally rather marked rises of temperature were observable. It is certain that fever does not improve the effects of the irradiation; in fact, it appears that the effects are thereby impaired. Therefore, on the appearance of rises in temperature, I interrupt the irradiation and begin again after an interval of from one to two weeks, frequently with the result that, during the second irradiation, the temperature remains normal.

What I have reported here does not constitute a method that has been completely worked out; it is only a renewed attempt to increase the susceptibility of the carcinoma to roentgen rays, pointing out a new way that has been shown to be feasible and has given good results thus far.

REFERENCES

1. FREUND and KAMINER: Biochemische Grundlagen der Disposition für Karzinom, published by J. Springer, 1925.
2. RUSSEL: British Jour. Exp. Pathol., I, 1921; III, 1922.
3. WARBURG and MINAMI: Klin. Wehnschr., No. 2, 1923; WARBURG, NEGELEIN and POSNER: Klin. Wehnschr., No. 24, 1924.
4. SILBERSTEIN: Wien. klin. Wehnschr., 1925.
5. SCHWARZ: Wien. klin. Wehnschr., 1923, 1924; Strahlentherapie, 1925.

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A STUDY OF THE OSSIFICATION IN BONE SARCOMA¹

By D. B. PHEMISTER, M.D., CHICAGO

OF the various pathological features presented by bone sarcomas, there are three of particular interest to the radiologist. These are bone destruction, new bone formation and the cytology of the predominating cell of the tumor. The first two are of interest because they can be studied in radiograms and aid greatly in the establishment of a diagnosis. The third is of interest because from the cellular structure it may be possible to predict to some extent the result to be expected from radiotherapy, particularly from the standpoint of palliation. Thus, in general, it is true that the more cellular and the less differentiated the sarcoma, the greater the response to radiotherapy and the better the immediate palliative result. Also, ossifying tumors show a resistance to treatment by irradiation that varies directly with the extent of ossification. This seems to be independent of the type of tumor bone formed, whether high or low. It may be dependent on the amount of lime salts deposited; the greater the deposit the greater the protection afforded the tumor cells. Elaborate classifications of bone sarcomas, based on cell or tissue type, are not after all of very great practical value, and the pathologist as well as the radiologist may be reasonably well satisfied when he has gone so far as to establish the diagnosis of primary malignancy of bone.

Ossification in bone sarcoma is a phenomenon which varies greatly in different tumors and in different parts of the same tumor. There is always bone destruction, but not always new bone formation. Two types of new bone may be formed, namely, tumorous and non-tumorous, and it is usually possible to tell them apart in the radiograms. Tumorous bone, either in the primary lesion or in the metastasis, arises from tumor cells which possess an inherent tendency to ossify. Non-tumorous bone

arises from osteoblasts of the normal bone in which the tumor develops.

Tumor Bone. The tumor bone varies greatly in amount and arrangement in different tumors. In markedly ossifying lesions the entire tumor may be converted into bone, while in others the bulk of the lesion remains unossified. The earliest new bone is laid down in contact with the old bone and ossification proceeds toward the periphery of the tumor as it increases in size. In the markedly ossifying lesion the new bone is of a dense, spongy structure and does not radiate toward the periphery, except occasionally in its superficial portions. In the less markedly ossifying lesion the first bone to be laid down may be spongy in its arrangement, but the more recently formed bone that extends toward the periphery is usually deposited in rays. From a structural standpoint the new bone is generally so arranged as to support the tumor mass and not to strengthen the old bone from which it springs; hence the radiating arrangement. However, in markedly ossifying lesions the old bone may be eroded and replaced by dense new bone which preserves the continuity and strength of the shaft. I have seen ossifying sarcoma recurring about a bone graft lead to consolidation of a fracture through the graft. Metastases from sarcomas showing tumor ossification also ossify, and the extent of ossification and the type of bone formed conform closely to those of the primary tumor.

Microscopically new tumor bone may vary all the way from an extremely low, immature, calcareous structure to a mature and well formed type of bone that could scarcely be told from normal. In the most pathological type of tumor ossification, trabeculae, lacunae and homogeneous calcium deposits are absent. Lime salts are deposited in or about swollen collagen fibers that pursue a more or less straight

¹ Read before the Radiological Society of North America, at Cleveland, December, 1925.

course among the tumor cells. There may be extensive, coarse, granular, calcareous deposits, giving a picture of both calcification and ossification in the same field. More highly differentiated bone may form,



Fig. 1. Radiating non-tumorous bone within a tibial metastasis from a carcinoma of the prostate.

in which there are trabeculae containing lacunae and bone cells with lime salts deposited homogeneously. The cancellous spaces contain tumor cells that may show evidences of malignancy. In this type of bone there is absence of lamellation and the tumorous nature of the new bone can readily be made out. A maturer type of cancellous bone may form, in which lamellation is seen and in which cells presenting the usual characteristics of malignancy are absent from the cancellous spaces. Bone marrow cells may be present and it may be extremely difficult or impossible to distinguish between such bone and new non-tumorous bone. It should be remembered that the extent of deposit of lime salts is no index to the degree of differentiation and maturation of the tumor cells. There may be extensive tumor ossification in a very undifferentiated osteogenic sarcoma and little or no ossification in a more mature and less malignant type of tumor tissue.

Tumor bone is usually formed by fibrous or intramembranous ossification, but if the tumor contains cartilage there may be endochondral ossification. This is seen both in chondrosarcomas and in peripheral osteogenic sarcomas, where cartilage appears as one of the three stages—fibrous, cartilaginous and bony—in the process of tumor ossification, analogous to the fibrous, car-

tilaginous and bony stages in the peripheral callus of healing fractures.

Non-tumorous bone may arise either from the periosteum or the endosteum in the vicinity of the tumor. It is seen mainly

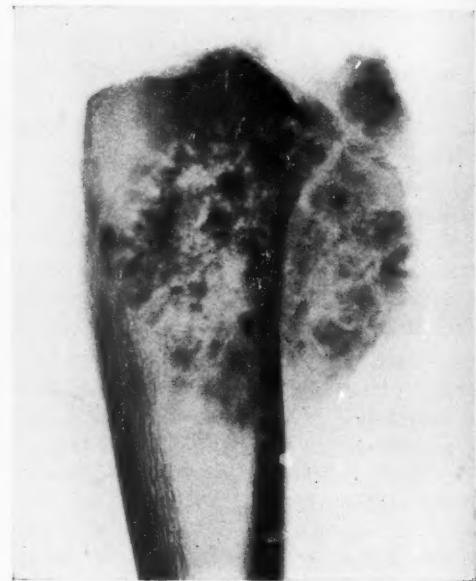


Fig. 2. Radiogram of a slice from a densely ossifying osteogenic sarcoma of the upper end of the tibia. Tumor bone only.

in tumors that develop during childhood and adolescence; in those of adults it is either very limited in amount or absent. It forms either from the stimulative action of the growing tumor or as a compensatory measure to replace the old bone that is destroyed by the neoplasm. It forms most abundantly from the periosteum in central destructive sarcomas in adolescents and is to be seen as a layer about the cortex beyond the limits of the tumor and at the level of the tumor where the outer portion of the cortex has not been destroyed. It may form in small amounts from the endosteum of the medullary canal beyond the limits of the tumor. In primary peripheral sarcomas the endosteum may form a layer of spongy bone at the level of the tumor before the cortex has been extensively destroyed from without inward. New non-

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tumorous bone about the sarcoma is of a spongy structure and very similar to the callus formed in healing fractures and to the new bone formed in osteomyelitis. It rarely becomes dense and lamellated, since it is usually eroded by the spreading sarcoma not long after it is laid down. Non-tumorous bone coming from the periosteum can usually be distinguished from tumorous bone, both by gross pathologic and by radiologic examinations. It is located outside of the tumor and is arranged in a layer along the cortex. It also is rarely seen in adults.

Non-tumorous bone may invade certain sarcomas, growing out from the old cortex into the substance of the tumor and forming a supporting framework, which radiates similarly to tumor bone in ossifying sarcoma. In this case it may be difficult to distinguish it from tumor bone. It is usually not as extensive in amount as tumor bone and is generally accompanied by non-tumorous bone lying outside the sarcoma. As previously reported (1), radiating non-tumorous bone may also form within the secondary invasions of the skull by meningiomas giving rise to overlying hyperostoses and in osteoplastic carcinoma metastases that project externally from the bone. Figure 1 shows such radiation of the new bone in a metastasis in the tibia from a carcinoma of the prostate.

For purposes of roentgenologic study of their ossification, we may divide bone sarcomas into four main groups: (1) Those containing tumor bone only; (2) Those containing both tumorous and non-tumorous bone; (3) Those containing non-tumorous bone only; (4) Those containing no new bone.

1. *Bone sarcomas containing tumor bone only* are seen mainly in adults. They are either osteogenic sarcomas or chondrosarcomas. Osteogenic sarcomas usually arise centrally. They erode the cancellous bone and cortex, making a lesion which fills much of the space in the end of the shaft and also appears soon as an external swell-

ing. The degree of ossification varies, but it is often marked. The new bone forming in the portion of the tumor lying within the old bone has an irregular spongy arrangement. There may be portions of cortex

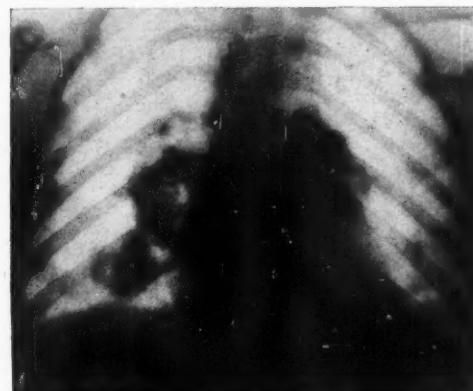


Fig. 3. Ossified metastases in lungs from tumor in Figure 2.

and spongy bone that remain uneroded and are surrounded by it. The external swelling is usually of a dense, spongy structure in its deeper portions, but there may be radiating spicules about the periphery. There is no layer of non-tumorous periosteal new bone tapering off on the shaft about the limits of the tumor.

Figure 2 shows a radiogram of a slice 1 cm. thick cut from a centrally beginning osteogenic sarcoma of the upper end of the left tibia in an eighteen-year-old girl. The limb was amputated seven months after the onset of symptoms. The entire tumor was densely ossified. Five months after amputation chest symptoms began and radiograms showed multiple ossifying metastases in the lungs (Fig. 3). Two months later a bony lump appeared in the region of the left iliac lymphatic glands (Fig. 4). Death occurred six months after the amputation, at which time there were extensive ossified nodules in the lungs and in the left iliac and lumbar glands. Microscopically the new bone was of a very primitive and undifferentiated type and was of the same structure in both the primary tumor and the

metastases. No cartilage was found in the tumor.

Primary periosteal tumors of this type are comparatively rare. They produce a large external tumor in which the new

pleura. There were also several metastases in the skin of the scalp and left side of the face. These showed the same variation in structure as did the different parts of the primary tumor. Some were bony,



Fig. 4. Ossified metastases in regional iliac lymph glands from tumor in Figure 2.

bone may be spongy or may radiate toward the periphery. They may contain varying amounts of unossified tissue, including a considerable amount of cartilage, which is usually at the periphery of the new tumor bone, but which may be collected in large islands. The cortex may be perforated and the medullary canal invaded. The intramedullary invading tumor may or may not show as marked ossifying tendencies as the peripheral portion of the tumor.

Figure 5 shows a radiogram of a slice 1 cm. thick cut from the middle of a primary periosteal osteogenic sarcoma of the upper end of the right humerus in a man aged forty. All of the newly formed bone was within the tumor and of the tumor. At "b" there was a large mass of cartilaginous tumor that presented only traces of calcification and ossification. There were ossifying metastases in both lungs and in the right

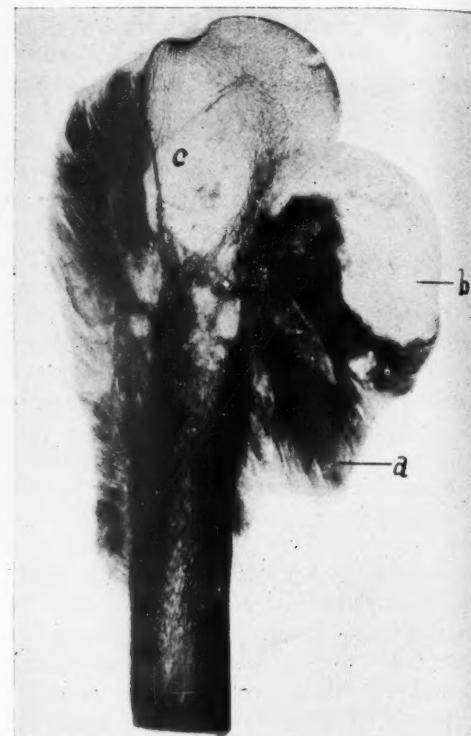


Fig. 5. Radiogram of a slice from an osteogenic sarcoma of the upper end of the humerus, composed of (a) bony, (b) cartilaginous and (c) unossified spindle celled areas. No non-tumorous bone. Metastases from this tumor to lungs and skin ossified.

some were mainly cartilaginous and others were fibrous, being composed largely of spindle cells and intercellular substance that contained little or no lime salts.

That radiotherapy exerts little influence on markedly ossifying sarcomas is substantiated by the fact that both tumors heretofore mentioned received intensive irradiation without noticeable effect.

Primary chondrosarcomas usually show some tendency to calcification and ossification. They are rare in comparison with the straight osteogenic sarcoma and may begin

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peripherally or centrally. A moderate amount of calcified cartilage and bone may appear in them and these may form islands that are separate from the old bone. In radiograms, isolated calcareous shadows

Following exploration, the tumor rapidly broke through the non-tumorous bone and four months later (Fig. 7) showed tumor bone that radiated on the mesial side and was irregularly arranged laterally, where



Fig. 6. Non-tumorous bone about a central osteogenic sarcoma of nine months' standing, simulating osteomyelitis.

within the confines of a tumor, either primary or metastatic, are almost pathognomonic of chondrosarcoma.

2. *Bone tumors containing both tumorous and non-tumorous bone* are seen mainly in adolescents. At this age an osteogenic sarcoma with radiating new tumorous bone within its substance may stimulate periosteum to form a varying amount of non-tumorous bone on the shaft beyond and along the uninvolved cortex at the level of the tumor.

Figure 6 shows a radiogram of a tumor of the upper end of the femur in a boy aged seventeen. It was taken nine months after the onset of symptoms, and shows a spindle-shaped thickening of the shaft, which was mistaken for osteomyelitis because of the arrangement of this non-tumorous new bone and the absence of radiation.



Fig. 7. Same case as Figure 6, shown four months later. The tumor has broken through and shows tumor ossification arranged in rays medially (a) and irregularly laterally (b). Non-tumorous bone (c) is present below.

the exploratory and curetting operation was performed. Much of the callus-like non-tumorous bone remained below as a periosteal thickening.

3. *Bone sarcomas containing non-tumorous bone only* occur also largely in adolescents and are central destructive lesions which stimulate the periosteum of the vicinity to new bone formation. The non-tumorous new bone has the same characteristic as that described in Group 2. Pathological fracture may develop, in which event additional layers of new bone may be deposited. Occasionally there may be irregular ossification about the periphery. The type of tumor which Ewing designates as endothelioma is particularly apt to produce this

picture. Radiating non-tumorous bone, usually limited in amount, may form within the tumor as an outgrowth from the old cortex.

Figure 8 shows a radiogram of a slice

living tumor about the periphery. A small amount of non-tumorous bone may be formed by the periosteum about their limits, but it casts little shadow in the X-ray, so that radiographically one sees mainly

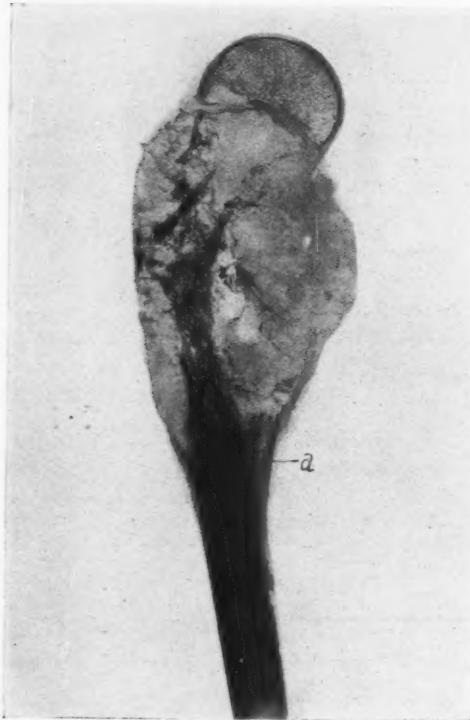


Fig. 8. Radiogram of a slice from a central destructive sarcoma (Ewing type of tumor), showing only non-tumorous new bone (a) beyond its lower limits.

of a tumor of the right humerus of a fourteen-year-old boy, which was amputated fourteen months after the onset of symptoms. The cortex is mainly destroyed at the level of the tumor and the periosteum has formed a thick layer of new bone on the shaft below the tumor, but there is no ossification within the tumor.

Telangiectatic sarcomas occurring in adolescents or young adults invade both the cancellous bone and medullary regions and extend through the cortex, making a peripheral swelling. They break down rapidly, leaving a cavity filled with blood and necrotic tumor with only a small amount of



Fig. 9. Radiogram of a central destructive sarcoma of the upper end of the ulna, showing neither tumorous nor non-tumorous new bone. Displaced fragments of old cortex are incorporated in tumor.

bone destruction and the shadow of the soft parts tumor.

4. *Bone sarcomas containing neither tumorous nor non-tumorous bone, or, at most, only traces of ossification, are of common occurrence in adults.* They nearly always arise centrally, although there is occasionally a primary periosteal fibrosarcoma of this type. They erode bone irregularly and usually soon break through cortex and periosteum on one side. When small and confined almost entirely to the bone, they may be confused roentgenologically with central giant cell tumor, but their outline is much more irregular than that of the latter. They enlarge rapidly, eroding the cortex extensively, and invade the soft parts surround-

ing the bone. New bone does not form from the periosteum about their periphery, as is sometimes the case in the expansile type of central giant cell tumor. They usually run a rapid course and produce metastases which also are free from ossification.

Microscopically these tumors are composed mainly of spindle cells, but there may also be round cells and small tumor giant cells. Occasionally there is extensive intercellular substance with collagen fibers, but without tendency to ossification. It is questionable whether they should be classed as fibrosarcomas or as osteogenic sarcomas that do not ossify. Some of them correspond so completely to the fibrosarcomas that have their origin outside of the skeleton, that I believe they should be classed with this group of tumors.

As an example, Figure 9 shows a radiogram of a slice cut from the middle of a large central sarcoma of the upper end of the ulna, amputated from a man aged twenty-seven, eight months after the onset. The

cortex had been eroded and small fragments carried outward by the expanding tumor. There was no sign of new bone formation, even on microscopic examination. The tumor consisted almost entirely of spindle cells with little intercellular substance. The patient died of non-ossifying metastases in the lungs.

There are many cases of central destructive sarcomas of the long bones in which irregularly arranged new bone forms in the substance of the tumor about uneroded portions of cortex. In this group it is often difficult to say either from the arrangement of the new bone or from microscopic appearances whether it is tumorous or non-tumorously in nature. However, these cases are in the minority and even when the exact genesis of the new bone cannot be stated it is usually possible to say from its features that the lesion is of a sarcomatous nature.

LITERATURE

1. PHEMISTER, D. B.: The Nature of Cranial Hyperostosis Overlying Endothelioma of the Meninges. *Arch. Surg.*, 1923, VI, 554.

BONE MALIGNANCY FROM THE ROENTGENOLOGICAL ASPECT¹

By HOWARD E. RUGGLES, M.D., and LLOYD BRYAN, M.D., SAN FRANCISCO

UNCERTAINTY in the diagnosis of malignant bone disease is directly related to its rarity. At the present time many of these lesions cannot be indexed. Competent pathologists are not in agreement upon their origin, evolution, or classification. Collection of material is obviously the first step toward remedying this condition, and a splendid beginning has already been made in the registry of bone sarcoma under the direction of the American College of Surgeons, with Dr. D. B. Phemister as registrar, deserving the earnest support of every roentgenologist. Registration of every bone tumor seen would result in the growth of this collection by several hundred cases annually. Though these patients may not be under our personal care, much may be done by constant pressure upon the surgeons who see them. It takes time and effort, but it is a small contribution to make to the progress of scientific medicine.

At the present time we can recognize with fair accuracy typical examples of the following primary tumors:

1. Giant-cell tumor.
2. Osteogenic sarcoma.
3. Undifferentiated osteogenic sarcoma.
4. Endothelioma.
5. Myeloma.

Further subdivision is impossible from roentgen-ray evidence and must await the accumulation of a volume of well recorded cases.

There are many borderline and atypical lesions which are not clean-cut either roentgenologically or pathologically. Growths may start as one form and develop into another. It is probable that a few giant-cell tumors become malignant. Harmless exostoses have changed into characteristic osteogenic sarcomata after a period of years, though their tendency to recurrence

and metastasis is slight. Malignant processes may change their rate of growth and become relatively benign or rapidly fatal.

Giant-cell tumors are single central lesions, occurring in the epiphyses of long bones. They expand and thin the cortex, but do not break through it unless a pathological fracture occurs. They do not invade the soft tissues, but may extend along ligamentous attachments into adjacent bones. Their appearance is characteristic. They are rarefied areas showing thin-walled trabeculae somewhat suggestive of soap bubbles. There is asymmetrical expansion of the affected region, with a tendency to follow into processes and condyles. They extend to the joint cartilage but do not invade it. There is no periosteal reaction unless fracture is present. They are most common in the age period of twenty to forty. In a series of cases reported by Holmes, 64 were located in long bones, 5 in the spine, 4 in the pelvis, and 2 each in the scapula and jaw. Malignant changes are possible but extremely rare.

Osteogenic Sarcoma. This is a single lesion involving cortex, medulla, or both. It is practically always seen in the distal third when it occurs in long bones. As Ewing has emphasized, "a location in the middle third of the shaft is strong evidence against an osteogenic tumor." These growths appear before thirty, tend to recur locally, and produce pain, fever and metastases. Their extension is to the lungs and occasionally the brain. Regional lymph gland enlargement is usually inflammatory. Metastases develop in one to two years as a rule, but have been seen as late as fifteen. The determining factors in the prognosis are the age of the patient, the structures involved, and the essential malignancy of the process. When the patient is under twenty, or the tumor is grow-

¹ Read before the Radiological Society of North America, at Cleveland, Dec., 1925.



Fig. 1. Case 1, aged 12 years. Early osteogenic sarcoma, showing condition December 15, 1922. Duration of symptoms, about one month.

Fig. 2. Same case as in Figure 1, showing condition on January 12, 1923. Died March 26, 1923.

ing rapidly, the disease is always fatal. Of the 347 cases now on record in the registry, 12 are thought to be five-year cures—about 3.5 per cent.

Röntgenologically, the subperiosteal is the most common form. It begins as an irregular erosion of the cortex, with very early elevation of the periosteum and new bone formation at the margin of the growth: this is its most important characteristic. In rapidly growing tumors this limiting reaction of the periosteum may be absent. A soft tissue tumor may be evident. As the process develops, the reaction at the margin increases, erosion of the cortex becomes more prominent, the medulla is involved, and a variable amount of calcification appears in the soft tissue tumor. This may take the form of strands lying at right angles to the shaft, coarse deposits irregularly distributed, or dense ivory-like masses about the shaft, according to the rate of growth and the type of cell present. These

tumors may reach a large size. Tendinous insertions offer considerable resistance to their progress.

The medullary form gives an irregular area of rarefaction in the cancellous bone, showing no well organized trabeculation within it. Rupture of the cortex and extension into the soft tissues occur early.

Lesions of the flat bones are usually of the medullary type, with bone destruction as their predominant feature. In some cases there is an amount of trabeculation which gives them a strong resemblance to giant-cell tumors.

Undifferentiated sarcoma is a purely destructive process which takes everything before it. The lesions have fairly sharp, irregular margins and there is no trace of bone reaction.

Endothelioma appears in two forms, probably depending upon whether it develops from the blood vessels of bone substance or of marrow. In the first form,



Fig. 3. Case 2, aged 14 years. Early osteogenic sarcoma, showing condition November 20, 1924. Duration of symptoms, three weeks.

Fig. 4. Same case as in Figure 3, showing condition on February 13, 1925. Died in June, 1925.

they are similar to osteogenic sarcoma and probably many are diagnosed as such. They are situated somewhat farther from the ends of the long bones and there is more localized destruction of the cortex. There is usually more periosteal new bone formation, which may occur in layers partially or completely surrounding the tumor. The second form produces a mottled or coarsely trabecular structure in the affected bone, somewhat suggestive of osteitis deformans in some cases and of myeloma in others. Usually a considerable portion of the shaft is involved. In the flat bones it may resemble giant-cell tumor.

The difficulty in differentiating the first form from osteogenic sarcoma is of little practical importance, as it is an equally fatal disease and many pathologists classify it as osteogenic sarcoma. The second type may be separated from myeloma by the fact that it is a single lesion and by the absence of albumosuria. Osteitis deformans does not usually occur in single lo-

calized lesions, and runs a benign course. Endothelioma does not expand the bone as strikingly as giant-cell tumor and the trabeculation is heavier and coarser.

Myeloma appears in multiple foci, always in cancellous bone, and is most common in ribs, sternum, vertebrae, skull, femur, and pelvis. The tumors are small nodules or large bulky growths, chiefly in males of the fourth and fifth decades. They produce considerable deformity in outline of the bone, due to irregular growth, and usually show coarse trabeculation. Individual lesions in flat bones may resemble giant-cell tumors or endotheliomata, but the presence of other lesions will exclude them.

The relative frequency of these processes in the registry is as follows:

Out of a total of 650 cases—

170, or 26%, are giant-cell tumor;
263, or 40%, are osteogenic sarcoma;
70, or 10%, are endothelioma;
14, or 2%, are myeloma.

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Fig. 5. Case 3. Undifferentiated sarcoma.

Our material consists of 72 cases of malignancy from the following sources:

	Total case numbers
University of California Hospital.....	39 40,000
St. Luke's Hospital.....	11 20,000
Stanford University Hospital.....	8 40,000
Miscellaneous laboratories	14 120,000
	72 220,000

Approximately, one case for every 3,000 examinations.

Table I shows the age distribution and location of these lesions. Forty are in long bones, and 32 in flat bones. The greatest incidence is in the age group from 20 to 30, which shows 16 cases in the long bones and 11 in the flat. It is of interest to note that between 10 and 20 practically all the lesions are in the humerus and tibia, and

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TABLE I

Ages	Long Bones				Flat Bones			
	Femur	Tibia	Humerus	Other	Spine	Ilium	Scapula	Skull
0-10	2	1						3
10-20	1	4	5	1 patella		2	1	
20-30	9	4	2	1 radius	2	3	2	1 tarsus
30-40	3	1					1	2 ribs
40-50		2				1		1 sternum
50-60		2		1 metacarpal	5		2	1 carpus
60-75		1					1	1 tarsus
Totals	15	15	7	3	7	6	4	6



Fig. 6. Case 4. Probable endothelioma

that there are 5 cases in the spine in individuals over 50.

Of metastatic processes, carcinoma is the most common and the most characteristic. The multiplicity of the lesions, their wide distribution, and the moth-eaten appearance of the bone are well known. The form due to scirrhouous growths presents sharply defined cyst-like areas of all sizes and shapes, scattered throughout the skeleton. The bone-forming type secondary to prostatic disease is a striking and familiar

picture. These last two varieties run an exceedingly long course, up to ten years. Extensive carcinomatosis is sometimes accompanied by Bence-Jones bodies in the urine, leading to confusion with myeloma. The character of the lesions and the discovery of a primary tumor should help to differentiate them.

Hypernephroma occasionally gives rise to but a single metastasis, which, in the absence of kidney symptoms, is mistaken for a primary bone lesion. Any focus occurring in the middle third of the shaft of a long bone or close to a nutrient artery in a flat one should raise a suspicion of metastatic disease.

Lymphoma — particularly common in the spine—may appear in cancellous bones in individuals who have had prolonged radiation. It resembles carcinoma.

Since benign processes remain 99 per cent localized and malignant ones are almost uniformly fatal, our responsibility lies in the recognition of both in their early stages. Unfortunately, in the latter group, as in other forms of malignant disease, neither patient nor surgeon is willing to undertake sufficiently radical treatment at a time when it is essential. When the diagnosis is evident the termination is equally so. Amputation is useless except for the removal of bulky or painful masses.

In conclusion, grateful appreciation is due Doctors Chamberlain, Rehfisch, and Rodenbaugh for the privilege of including their material in this report.

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THE SURGICAL ASPECT OF BONE TUMORS¹

By HENRY W. MEYERDING, M.D., F.A.C.S., Section on Orthopedic Surgery, Mayo Clinic,
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THE development of a newgrowth invariably brings up the question of benignancy and malignancy. The general practitioner, after careful history-taking, physical examination, and the interpretation of laboratory data at his immediate disposal, is often unable to make a definite diagnosis. Indeed, few physicians are so skilled as to assume willingly the sole responsibility of diagnosis, prognosis and treatment. The roentgenologist or the surgeon who is experienced in interpretation of roentgenograms of osseous lesions may strike a high percentage of correct diagnoses. There are, however, certain lesions, few in number perhaps, yet always present, that baffle the clinician, surgeon and roentgenologist until exploration is performed, when gross and microscopic findings are available. No doubt there are rare instances in which all diagnostic aids fail to reveal the presence of malignancy until metastasis or death occurs.

Unless the surgeon can make a positive diagnosis of a localized benign tumor, he must depend on the roentgenogram to determine the local or general type of the growths, and differentiate them if possible. When a malignant growth is found, he must depend on the roentgenogram for evidence of pulmonary metastasis, as it reveals such metastasis long before clinical signs are apparent. If metastasis is not found and operation is decided on, right-angle views of the lesion give important data as to the site, size, origin, penetration, or invasion of periosseous structures, and as to whether the condition is benign or malignant. Certainly no operative procedure is justifiable, if malignancy is suspected, without the roentgenographic examination of the chest. Occasionally, multiple benign tumors, mul-

tiple malignant tumors, and metastasis to bone from the internal organs must be differentiated, and here again the roentgenogram plays an important part.

At the present time one would hesitate to make a definite diagnosis or prognosis, or to treat such tumors without roentgenographic aid, unless they have been in existence long enough practically to exclude malignancy, or unless the patient's condition clearly demonstrates the character of the growth. Roentgenologists who assume the responsibility should, in doubtful cases, co-operate with an experienced surgeon. In the last analysis the clinical and laboratory findings, the gross and microscopic findings, and the roentgenograms should all be considered, as it is through co-operative effort that the greatest value of the therapeutic agents can be secured.

The operability of the tumor is dependent on its local or general character; whether benign or malignant, it may be of a type and size or so situated as to prohibit surgical removal. Operation offers definite cure in certain benign cases, if the growth is accessible. It also permits definite diagnosis in doubtful cases and affords palliative relief if malignant growths are removable. The age and sex of the patient, the site, size and origin of the tumor, its penetration through or invasion into periosseous tissue, its proximity to important structures, danger of fracture, and the general physical condition of the patient, are further factors in determining the operability.

OSTEOCHONDROMA

Osteochondroma, exostosis, osteoma, and so forth, are benign tumors not difficult to diagnose. If removal is possible surgically, cure may be assured in a minimal length of time, with a minimal amount of expense. The periosteum should be cut so as to permit accurate and snug suturing after avascularization of the stump by cau-

¹ Read before the meeting of the Radiological Society of North America, Cleveland, Ohio, December 7-11, 1925.



Fig. 1. Bilateral multiple chondromas of the hands

terry and by a small drain left in for twenty-four hours, as a hemorrhage within the periosteal sac may lead to recurrence. Radium, if desired, may be used to avascularize the raw surface. In early cases operation may be deferred until symptoms appear, and radiotherapy has been given a trial. It has been my experience that these cases are usually recognized as benign, and the surgeon is seldom consulted unless the tumor has attained such size as to inhibit joint action, cause pain by pressure on nerves or blood vessels, or unless deformity from multiple tumors causes embarrassment.

Chondromas belong in the preceding group, yet they present difficulties in diagnosis and treatment which at times may tax the ability of even the most experienced physician (3). If diagnosis is made early, excision and immediate layer-closure effect

cure. It must be remembered, however, that both local and multiple tumors occur. The entire tumor must be removed by curettage; if not, there will be recurrence. Chemicals and the cautery are useful in the destruction of cells that occasionally remain. The tumor, consisting usually of hyaline cartilage, is pearl gray, avascular and friable. If the cortex is bulging it may be crushed in, the cavity filled with fat transplant if desired, and after layer closure, if the tumor is in an extremity, the extremity may be splinted to prevent fracture.

Illustrative case.—A young man, aged eighteen, was examined in January, 1918. When two years of age his parents had noticed a tumor of the proximal phalanx of the fifth finger of the right hand. There was no history of trauma. During the first four years new tumors were noted in the metacarpus and phalanges of both

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hands. These grew slowly, causing little discomfort or pain unless traumatized. There was surprisingly little disability, considering the size and number of tumors.

Operation consisted of thorough curettage of the tumors and crushing in of the thin bony walls of cortex after cautery. The pathologist reported chondroma. Three and one-half years after operation the patient reported that the operation was entirely successful.

Comment.—The tumors appear to arise in cortical and central areas at the ends and middle of bone, and are covered with a thin layer of bone (Fig. 1). Periosteum may be stretched but otherwise is not affected. Trabeculations appear in all tumors, due to irregular growth and bony septa.

OSTEITIS FIBROSA CYSTICA

Osteitis fibrosa cystica is a benign lesion, believed by some observers to be of inflammatory origin, and occurring in local and general form. The lesion occurs usually in the young; it grows slowly, causes absorption of bone, and new bone formation. Expansion takes place with mild rheumatic pain. The condition may be overlooked until pathologic fracture or a roentgenogram discloses the true condition. It may heal with or without fracture, which will lead to prolonged observation, repeated roentgenographic examination, splinting, and so forth. In many instances if patients are aware of the benign character of the growth, they permit it to gain such proportion as to make surgical removal extremely difficult, and sometimes impossible. I believe if an early diagnosis is made, the exclusion of multiple forms, thorough curettage, crushing in of exposed cortex, and layer suturing insure the best results (2, 5).

Illustrative case.—A young man, aged nineteen, came for examination in April, 1916, because of a bony enlargement, especially over the fifth metacarpal bone of the right hand, which had been present six years. There was no definite history of injury. Several attempts had been made to straighten the finger by extension, as he had been advised by his physician that there was a dislocation of the metacarpal phalangeal joint. Two months before he came to the clinic, a roentgenogram was made for the

first time, and a diagnosis of tumor made. Operation was advised. The patient complained principally of weakness in the right hand, but he had free use of all the fingers. There was no pain unless the tumor area was traumatized. The growth was slowly enlarging.

Examination showed a bony mass over the fifth metacarpal bone of the right hand, and there was some thickening of the proximal phalanx. Roentgenograms showed cystic degeneration of the fifth metacarpal bone, middle and proximal phalanges of the fourth and fifth fingers. There was slight tenderness on firm pressure. Examination of the nose and throat showed hypertrophic rhinitis, and large tonsils containing caseous material. The Wassermann reaction and urinalysis were negative.

The patient was operated on, and the contents of the cysts proved to be currant-red, gelatinous material. After thorough curettage, the cyst walls were crushed in, and the wounds closed without drainage. Cultures sent to the bacteriologic laboratory were reported to be "anaerobic agar, facultative anaerobic diphtheroid bacillus." The patient left the hospital the day following operation. When last heard from in June, 1924, he was well, and had had no further treatment.

Comment.—The fact that there was no history of injury in this case suggests the possibility of a degenerative process along the distribution of the ulnar nerve. Unfortunately, roentgenograms of the forearm are not available. Operation in this instance resulted in cure with a minimal loss of time.

These cysts occur in the cortical and medullary bone, causing absorption and expansion, and appear to have trabeculations due to irregular bony projections extending between and into the cysts, and to the production of new bone (Fig. 2). Cyst and fibrocystic disease appear in a number of conditions, such as Paget's, infection, and osteomalacia. The radiologist must bear in mind the local and general character of the tumor. As these fibrocystic growths increase in size, bulging outward, the cortex is thinned, but the periosteum, although stretched, is not perforated. The softening of bone leads to bending, crushing and pathologic fracture. Surgery cures the localized forms when diagnosed early and may prevent deformity and fracture



Fig. 2. Osteitis fibrosa cystica of the hands.

in some instances of the generalized type. The term osteitis fibrosa cystica is used in a broad sense to include the inflammatory cysts and the local and general types of fibrocystic disease.

GIANT-CELL TUMORS

Giant-cell tumors considered benign should be treated conservatively, provided functional improvement is possible. No doubt these tumors, formerly believed to be malignant, constitute part of the cases in which sarcoma was cured by amputation. With their recognition less radical procedures were employed, such as excision or curettage followed by cautery and chemicals, but such treatment was occasionally accompanied by alarming hemorrhage and led to packing of the wounds and consequent infection. The close proximity of the tumors to joints made this especially dangerous, and in some cases resulted in amputation. Cure is effected by excision or curettage in early cases; occasionally in cases of huge tumors amputation is done. Radiotherapy has proved of value post-operatively, and from the encouraging reports of Herendeen it would appear likely to supplant surgery in some cases.

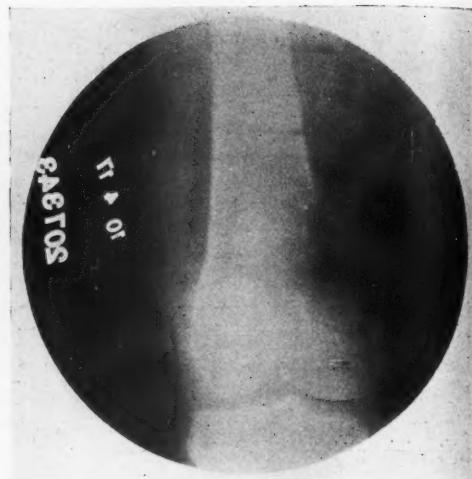


Fig. 3. Giant-cell tumor of the left femur.

Illustrative case. — A young woman, aged twenty-two, came to the clinic September 6, 1917, complaining of soreness and stiffness of the left knee, of five months' duration. A diagnosis of sarcoma was made from roentgenograms (Fig. 3). Injections had been given subcutaneously, but the symptoms increased and swelling occurred. Amputation had been advised, and the patient came to the clinic in the hope of avoiding it.

At examination the patient was found to be apparently healthy. There was swelling around the distal end of the left femur and knee, restriction of motion of the knee, and soreness over the internal condyle, but she was able to walk. Urinalysis and the Wassermann reaction were negative. Roentgenograms disclosed an area of destruction just above, and involving the upper portion of the internal condyle, and the condition was diagnosed by the roentgenologist as sarcoma. The tumor, which was irregular and hazy in outline, had apparently originated at the epiphyseal line, destroyed the cortex, and invaded cancellous bone. There was no line of demarcation between the tumor and the periosteal structures. A roentgen-ray examination of the chest was negative for metastasis.

At operation a soft tumor of "jam-like" consistency was thoroughly curetted and the actual cautery applied. The wound was packed, and a tube drain with 50 mm. of radium was left in for twenty-four hours. The pathologist reported "giant-cell tumor." The patient left the hospital the twenty-sixth day; drainage ceased the thirty-eighth day, when she was dismissed from observation. In April, 1924, there had been no

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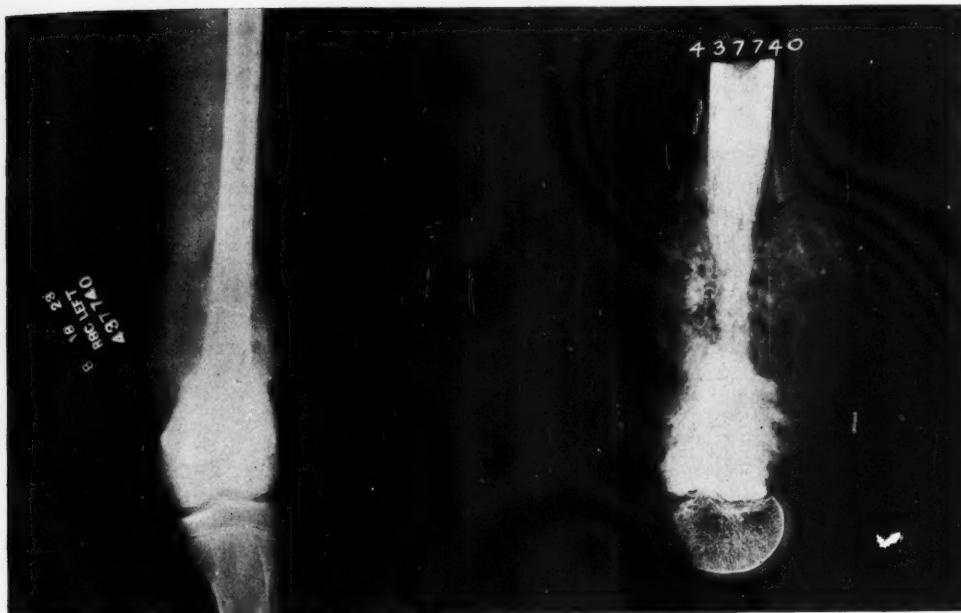


Fig. 4. Anterior view of osteogenic sarcoma of the lower third of the left femur.

recurrence, and no further treatment had been given.

Comment.—This case illustrates the danger of depending on the roentgen-ray findings in the diagnosis of bone tumors, and of advising amputation without exploration. The assistance of a reliable pathologist at operation is an added safeguard, both to the patient and to the surgeon. Conservative surgery saved the limb and its function.

ENDOTHELIOMA (EWING'S TUMOR)

Endothelioma was formerly classified as round-cell sarcoma of bone. The tumor usually affects the shaft of the bone as a diffuse swelling, involving the periosteum and periosseous structures, and causes pain of a moderate degree. Owing to the diffuse enlargement of the shaft, the slow rather than rapid growth, and the characteristic roentgenographic findings, the diagnosis can usually be made without operative interference. Radiotherapy appears to cause

Fig. 5. Longitudinal section of osteogenic sarcoma of the left femur.

a marked decrease in the size of these tumors, and in the pain for variable periods, depending on the faithfulness with which the treatment is carried out. Recurrence, however, may be looked for in the form of metastasis, whether excision, amputation, or roentgen-ray and radium treatment is resorted to. These tumors react more favorably to radiotherapy than any of the malignant bone tumors I have observed.

In the sarcoma group operation does not offer cure, but palliative relief. The patient, being relieved from pain and the sight of a growing neoplasm, improves in morale, gains weight, and spends a period varying from months to years in comfort and apparent health. Pulmonary metastasis, which is certain to occur and apparently is impossible to prevent, ends life in a comparatively short time. I have in the past advocated the combined treatment of radium, toxin, and operation (4). Radiotherapy may be given a thorough trial, the tumor carefully observed and operation resorted to as a palliative measure, although

the patient or relatives should be advised as to limitations of this treatment.

Illustrative case.—A boy, aged thirteen, complained of a rapidly growing tumor of the low-

er part of the right femur. Operation through the upper third of the femur was performed. The pathologist reported an annular osteosarcoma, 10 cm. long and 8 cm. in diameter. The patient's convalescence was uneventful, and he left the hospital on the ninth day after operation.

RADIOTHERAPY TREATMENT²

Date, 1925	Dis- tance, mm.	Fibra- tion alter- nate	Time, min- utes	Areas
8-30	16	6	40	Stump
8-31	16	6	40	Stump and groin
9-1	16	6	40	Groin and chest
9-3	16	6	40	Chest
9-24	16	6	40	Back, chest and pubis
9-24	16	4	7.5	Back and chest
9-25	16	6	40	Lower back
9-25	12	4	7.5	Stump
9-26	16	6	45	Chest and groin
9-26	12	4	7.5	Stump
9-27	12	6	45	Pubis
10-23	16	6	40	Back, chest and groin
10-24	16	6	40	Back, chest and groin
10-25	16	6	40	Anterior chest and groin
10-25	12	4	7.5	Left axilla
10-26	12	4	7.5	Right axilla
10-26	16	6	40	Anterior chest and groin



Fig. 6. Sarcoma of the lower third of the right femur. Note the raised periosteum at the upper margin and the radiating lines of bone formation in the substance of the tumor.

er end of the left femur of four weeks' duration. The pain was severe, and he limped. He had lost 10 pounds, was weak, and had a slight fever. Several physicians had been consulted and the father had been in favor of immediate operation and treatment.

At examination the boy appeared weak, in pain, and sick. A firm tumor with local heat and tenderness was palpable in the lower third of the femur. The circumference of the left thigh at the site of the tumor was 32.5 cm., and of the right thigh 26.25 cm. The temperature was 98.6°, and the pulse 86. The glands in the groin were slightly enlarged on the left side. Urinalysis revealed acid reaction, specific gravity 1.013, and a trace of albumin. Roentgenograms revealed sarcoma of the lower third of the left femur. Roentgenograms of the chest showed active metastasis. Operation was decided on, although it seemed only of palliative value, and radiotherapy of doubtful value. Am-

Coley's toxin was given twice a week under the direction of the family physician. The patient gained in weight, and had no pain or illness unless toxin reactions were considered. The stump was healed and there was no indication of recurrence. Four months later he was taken ill with what was thought to be heart disease, and died suddenly the third day, while sleeping.

Comment.—In Figure 4 the sclerosing of the shaft is seen plainly through the tumor. The periosteum is raised along the upper limit of the tumor and new bone has formed underneath. The invasion of the periosteal structures is obviously due to deposit of bone salts in tumor. The epiphysis does not appear to be involved, although sclerosis of the shaft extends to the epiphyseal line; this tendency is seen in osteitis fibrosa cystica which rarely invades through the epiphyseal line. On the other hand, benign giant-cell tumors and chondromas occur in the epiphysis and penetrate the epiphyseal line.

Destruction of the left femur is seen in Figure 5: osteolysis of the shaft, due to invasion by the tumor, and sclerosis and

² All doses were given through 5 milliamperes and 135 kilovolts.

osteogenesis of the shaft, most marked to either side of the tumor where pressure is not so great. Formation of new bone within the invading tumor is abundant, as shown by the sun-ray appearance due to bone salts in the radiating spicules. The epiphysis appears involved, although the diaphysis is sclerosed up to the epiphyseal line. The roentgenogram shows clearly the inaccuracy of the term "periosteal sarcoma" when applied to such tumors of osteogenic type.

Illustrative case.—A boy, aged sixteen, was brought to the Mayo Clinic by his physician in September, 1918, because of an enlargement of the right knee. Two months before his examination he had scratched the right leg on a wire and four days later noticed a swelling. Two aspirations had been performed without benefit.

The patient was 5 feet 8 inches tall and weighed 90 pounds. He appeared pale, poorly nourished, was weak, and had lost 10 pounds in two months. The systolic blood pressure was 130, and diastolic 100. A large fixed tumor was palpable which involved the lower third of the right femur; no local heat nor enlarged veins were noted. A diagnosis of sarcoma was made from the roentgenograms (Fig. 6). Roentgen-ray examination of the lungs was negative for metastasis. The Wassermann reaction and the urinalysis were negative. The hemoglobin was 70 per cent; the erythrocytes numbered 4,800,000, and the leukocytes 8,800. The surgeon's diagnosis at the clinic was sarcoma of the lower third of the right femur, and he advised amputation as a palliative measure.

Amputation was performed November 5 at the patient's home. His physician reported that he was apparently well until the onset of pulmonary symptoms of metastasis. There was no local recurrence. He died in December, 1920.

Comment.—The laceration of the right knee four days before the swelling appeared, and subsequent discovery of the tumor are of interest, but in this instance, trauma could hardly have been the etiologic factor, although it appears to be a factor in more than half of the cases of sarcoma of the long bones. It is more likely that the injury led to the discovery of the tumor. Operation afforded relief for twenty-five months, during which time the patient enjoyed a comfortable existence rather than being bed-ridden with a constantly growing neoplasm, pain and disability.

BIBLIOGRAPHY

1. HERENDEEN, R. E.: The roentgen ray treatment of giant-cell tumors. *Am. Jour. Roentgenol. and Rad. Ther.*, 1924, XII, 117-125.
2. MEYERDING, H. W.: Cystic and fibrocystic disease of the long bones. *Am. Jour. Orthop. Surg.*, 1918, XVI, 253-276; 367-382.
3. MEYERDING, H. W.: Chondromas. *Jour. Orthop. Surg.*, 1920, II, 77-91.
4. MEYERDING, H. W.: Sarcoma of the long bones. A study of microscopically proved cases. *Surg., Gynec. and Obst.*, 1922, XXXIV, 321-332.
5. MEYERDING, H. W.: X-ray findings in bone tumors; exostosis, chondromas, bone cysts, osteitis fibrosa cystica, giant-cell tumors. *Radiology*, 1924, III, 216-221.

RADIATION IN THE TREATMENT OF BONE TUMORS¹

By ALBERT SOILAND, M.D., and WILLIAM E. COSTOLOW, M.D., LOS ANGELES

THE radiation therapy of bone tumor has not been prosecuted with any degree of enthusiasm, and statistical reports are so unconvincing that no one is justified in drawing conclusions from the scanty literature on the subject. The direct question confronts us: Has radiation therapy of bone tumor proven of sufficient value to be seriously considered as a promising therapeutic agent in this field of pathology? It may be asserted that radiation has at least accomplished as much in bone tumor as any other type of treatment heretofore considered and used, but such a claim would not be sufficient to stimulate further study in this direction. From personal experience, we feel that we can look upon radiation as holding out a distinct promise, though we are not as yet on thoroughly proven ground.

The bone field for radiation therapy is sharply defined. Simple bone tumors, including exostoses, certain types of bone cysts and chondromas, are distinctly surgical problems. On the other hand, inflammatory tumors, sarcomas and carcinomas, are, in our opinion, preferably to be considered radiological problems. One year ago, one of us (W. E. C.) presented a report before this Society wherein three apparently clinical cures could be claimed in cases from our own service. These three cases have just been rechecked and found to be normal at this date. Since then, we have added another even more striking case that we had lost track of, but upon which complete data will be presented herewith. A brief résumé of this fourth case is as follows:

Mrs. S. K., age 56, adamantinoma right lower jaw. Reported for treatment February 13, 1922. Patient first noticed some enlargement of the right jaw and cheek about twenty years ago, a condition which increased gradually. The growth inter-

fered with eating and, about eight years ago, she consulted a physician. At that time some teeth were pulled, but her physician advised her that it would be unwise to attempt operation. After this, she consulted several other surgeons and was advised that nothing could be done. The X-ray diagnosis was adamantinoma. During the past year the tumor had been enlarging more rapidly than before. General health good. No pain, but considerable difficulty in eating on account of poor dental occlusion. Wassermann negative.

Examination.—Marked swelling of right lower jaw and cheek by a rounded mass about 8 to 10 cm. thick in its widest diameter. Tissue is of stony hardness. Protrusion of mass into floor of mouth, with misplacement of gum and teeth.

Treatment commenced March 31, 1922. Radium needles were buried into the mass from the inside of the mouth and heavily filtered high voltage X-ray was applied externally. The X-ray treatment was repeated several times during the following two years.

Nearly two years have elapsed since the patient received the last X-ray treatment. The skin looks normal—tumor mass can scarcely be made out from inspection. Some enlargement still remains in lower ramus. Inside of mouth looks normal. X-ray films made at this time show the remarkable reduction which has taken place. There is still a 50 per cent enlargement of the mandible. The cortex is not broken through and the condyle is well preserved. A cystic area remains at the junction of body and ramus. This is, so far as we know, the first case of adamantinoma permanently benefited by radiation.

Several cases of osteosarcoma of the sinuses have been under treatment and observation for periods varying from one to six years, with results that appear to be clinical cures.

¹ Read before the Radiological Society of North America, at Cleveland, Dec., 1925.

In carcinoma of bone, we are usually dealing with metastases, and the bones most frequently involved are those of the pelvis and lower spine. No bone area, however, is free from attack. In metastatic carcinoma of bones, it is useless to expect a cure, for when this stage is reached, the patient is so organically cancerized that therapy is of little avail. Nevertheless, radiation in such cases is of tremendous benefit to the patient in relieving pain, in restoring locomotion in some instances, and in minimizing to an extraordinary degree the usual distressing symptoms from which such patients suffer. For the sake of brevity, two cases only will be reported.

The first patient, Mrs. I., age 57, of good general physique, developed an extensive osseous metastasis from cancer of the thyroid gland. The bones of the skull, spine, pelvis, femur and tibia were invaded. Primary lesion of thyroid recurring after two operations necessitated intubation, as mass filled the entire trachea above the thyroid cartilage. This mass disappeared under radium and X-ray treatment, and normal breathing was restored in four months' time. There was no local recurrence in this region up to time of death, nearly two years after treatment.

A nodule in the frontal bone developed first. This produced some pressure symptoms and the nodule responded to radium treatment. Then, in succession, the bones of the spine and pelvis became involved about six months after the trachea had healed, necessitating morphine and hospitalization of patient. Roentgen-ray treatment in a short time relieved the pain and restored locomotion. A few months later, the left knee became lame and the patient could not walk. X-ray examination disclosed cancer of the tibia, and shaft and condyles of femur. Once again the patient required morphine and was confined to bed. Further X-ray to the affected area stopped the pain and permitted the woman to walk again. During the remaining year of her life, several such recrudescences appeared

in each hip joint, over the lumbar spine, and again in the knee; each time these regions responded to a comparatively small amount of radiation. Two years after her first treatment, the patient died from an overwhelming metastatic invasion, but up to the last, was kept comfortable under radiation. This is one of the most extensive cases of malignancy that has ever come to our notice.

Mrs. F., age 40, well nourished, developed metastases in scar and axilla of left breast following a complete extirpation for carcinoma five years previously. The metastatic areas were subjected to intense radiation, and in due course of time disappeared. One year after this treatment, the patient developed pain, with restricted motion, in left hip, began to lose flesh rapidly and took on the characteristic cachectic appearance. She was bedridden and required morphine. An X-ray examination demonstrated a large field of bone invasion in the left ilium and sacrum. X-ray treatment was instituted, and in one month's time the patient was able to walk, pain had disappeared, and her general condition improved rapidly. She has now been free from pain and discomfort for two years, has gained thirty pounds in weight, and is at present touring Europe, enjoying good health in every way. A card received this month describes in glowing terms her successful ascent of the Alps.

From the standpoint of humanity, the elimination of long periods of intractable suffering is no small achievement. The field of bone tumor radiation legitimately includes these cases as well as those showing complete cures; also those benefiting by longer or shorter periods in which they are clinically well.

In conclusion, we will urge upon the radiologists of this Society to check up carefully their bone tumor cases and submit to this body a brief report of facts, so that we can establish the best possible rationale for treatment of this important field of bone pathology.

DISCUSSION

DR. GEORGE CRILE (Cleveland): It is late, and I will keep you but a few minutes. There are three points I wish to make. The first is, that, as probably you all know, through the efforts of Dr. Codman, the committee on bone sarcoma of the American College of Surgeons collected a very large amount of material on bone sarcoma, which offers one of the most gloomy tales of end-results I have ever known on any subject, for my impression is that there are now only eleven cases alive out of several hundred or more authenticated cases of bone sarcoma, most of which had been treated by X-ray or by amputation and Coley's toxins, sometimes combined with X-ray and sometimes alone. That whole story means to me that those who are responsible to the public for the care of these cases have certainly a very large responsibility. I may not have my figures exactly right, but, as I have said, I think that only eleven cases are now living and I suspect that in these eleven the diagnosis may have been mistaken.

The second point I wish to speak about represents a *hope*, rather than anything else. It seems to me there is a possibility that, in addition to the other fine work that has been done by the roentgenologists, you may develop some type of roentgenograph entirely different from what you are now producing, which is a mere shadow. That in this new type of X-ray analysis you may be able to make diagnoses of malignancy from another point of view, that is to make a chemical analysis of the tissues themselves by means of the X-ray spectrometer. By this means we may be able to find the arrangement of certain groups of atoms in the tissues, and there is a remote possibility that we may find that there are specific arrangements for this or that type of malignant tumor.

The last point I wish to make is that I believe this Society has certainly performed a great function in making its meetings and its work so attractive, and I wish to pay a tribute to the spirit of co-

operation with the physicians whom you have invited to your symposia. The talents of the distinguished men who have appeared here show the width of your spark gap; and, in addition, I may say that as for this symposium on bones, it seems to me your spark gap is not nearly so wide as it was last night in the symposium on goiter.

DR. L. T. LEWALD (New York): I would like to voice Dr. Ruggles' sentiments, also previously expressed by Dr. Pancoast, of the advisability of having radiologists on the Bone Sarcoma Registry Committee of the American College of Surgery, or, at least, that these cases be referred to roentgenologists for their opinion. One of the proven successful cases is one that I radiographed. It is difficult perhaps to find that every case fits all of the criteria in regard to malignancy of a given type, but that particular case was one of periosteal sarcoma of the femur, amputated by Dr. W. A. Downes, and is now alive and well about thirteen years later. This patient has been presented at several medical meetings and she herself feels somewhat, as Dr. Crile expresses it—because she is one of the few cases alive—that her tumor might after all have been less malignant than thought and she is now ready to blame the surgeon for amputation, believing that her case might have yielded to less radical surgery.

DR. MEYERDING (closing): In discussing the subject of giant-cell tumors I believe we should emphasize diagnosis, which is not always as simple as it appears to be. Very often in such cases surgery offers immediate relief and cure without the worry and loss of time and all that goes with it that other treatments entail. Furthermore, I wish to say that surgery offers definite cure in certain cases of benign bone lesions, and, while it may fail to afford definite relief in the malignant cases, it does afford palliative relief.

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ACTINOMYCOSIS OF THE LUNGS¹

By GEORGE TURNER, M.D., EL PASO, TEXAS

ACTINOMYCOSIS" is the name given to a disease caused by any one of several strains of an organism belonging to the streptothrix group. The organism consists of a central mass from which branching filaments radiate, and may or may not present end-bodies. The filaments show true branching, which separates the organism from the bacteria. The central mass is a meshwork of finely branched mycelium. The filaments of some strains are acid-fast, while in others they are not. This probably has something to do with difference in virulence and the strong resemblance of some cases to tuberculosis.

Let us consider the organism with reference to its habits of growth, distribution and mode of infection. The organism is present in the air, on grain, in the soil, around carious teeth, and in the intestinal tract of man. It is doubtful if the strain found on plants and grain has much to do with actinomycosis in man, since a large number of the cases reported occurred in persons who had nothing to do with grain or dry plants. The normal skin and mucous membrane are practically impervious to its entrance, but when it once enters and begins growing in the tissue, it is very difficult to eradicate. The channels and order of frequency of entrance into the body are as follows: Mouth, respiratory tract, gastro-intestinal tract, and skin. I have recently examined smears from the gum-lines of 94 school children having carious teeth, and found branching streptothrix in 76 of them. The infection in the lungs may occur from direct aspiration of the organism, through the blood stream by metastasis, or by direct continuity through adjacent tissues.

The most frequent location of the lesion is about the jaw, with the lungs third in order of involvement. Untreated pulmonary lesions pass rapidly from bad to worse, and the possibility of cure rests en-

tirely upon early diagnosis. Because of the fact that the early tissue reaction toward the organism is fibrosis and granulation, the radiologist is apt to see the first evidence of pathology in the primary lung cases. The organism is not found in the sputum until there is breaking down of a granuloma, with drainage into a bronchus. It may be found in the pus, after empyema has occurred and been operated on, or in the discharge from a spontaneously occurring sinus, but by the time a lung is sufficiently involved to have a resulting empyema, or spontaneous sinus, any sort of treatment will be of little avail toward effecting a cure. It is true that the diagnosis is not complete with X-ray study alone, but the disease presents several distinguishing features which, when coupled with clinical findings, history and laboratory examinations, complete the diagnosis.

From an X-ray point of view, there are two types of actinomycosis of the lungs: In one type the infection involves the hilus and extends along the bronchi, producing peribronchial infiltration, with extensive fibrosis. It may extend along any bronchial trunk, but is more likely to course downward than upward. In this type of infection, the granulomatous masses are miliary in size and very dense along the inner lining of the bronchi. When these granulomas suppurate, expectoration is profuse, most likely blood-stained, and contains the organism of actinomycosis. The other type involves the lung tissue proper and presents a picture of abscess. Pleural involvement soon occurs, with possible empyema and fistulous tracts through the skin. The infection may begin as a bronchial type and continue for some time as a severe and stubborn bronchitis, when a well-defined circumscribed area will appear in the lung tissue. A tendency of the disease is to jump across what appears to be normal tissue. New areas of involvement are not neces-

¹ Read before the Radiological Society of North America, at Cleveland, Dec., 1925.

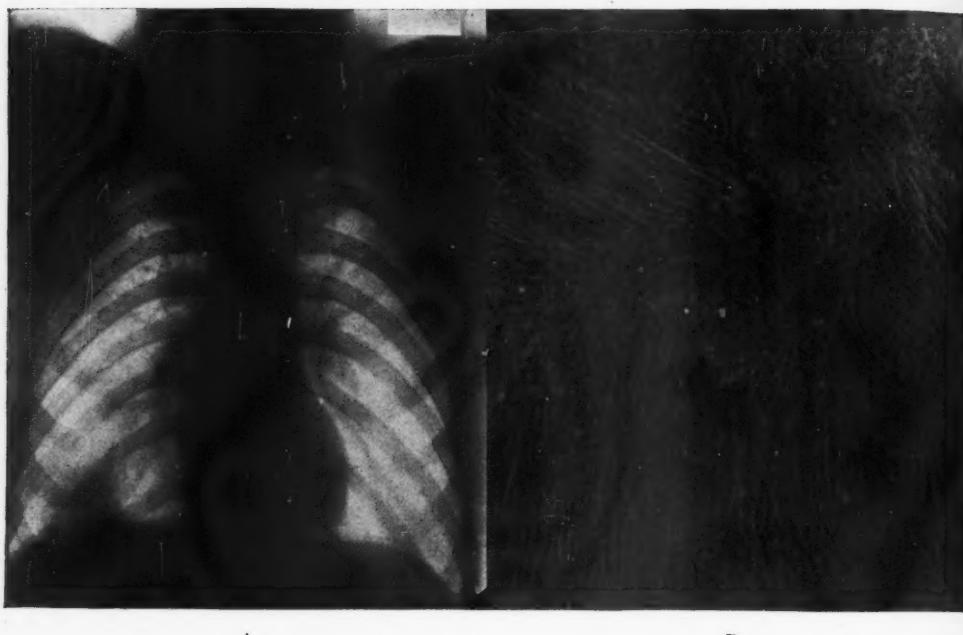


Fig. 1. (A) Radiogram showing mass in lower right lobe. (B) Photomicrogram showing central mass and radiating mycelia from a 5-day-old glucose-agar culture.

sarily enlargements of an infected area, but new foci will appear well separated from any other lesion. A pleural involvement will occur when no abscess exists, or, if there is an abscess, when it is well separated from the pleura.

The tissue reaction toward the organism is, first, a granuloma which may be miliary in size. The confluence of many such granulomas produces an area of involvement limited only by the diffuseness of infiltration. The tumor thus formed suppurates within two or three weeks, resulting in an abscess pocket, lined with a rather thick wall of granulation tissue. The nature of the lesion is not to remain long in this condition. It will either communicate with a bronchus and its contents empty in such manner, or else with the pleura and ultimately through a sinus to the skin surface. The lesion is more progressive than the usual lung abscess encountered in tuberculosis or following pneumonia. By making X-ray plates at intervals of about two weeks and comparing the plates with those previ-

ously made, the condition can be differentiated from other forms of lung abscess.

Syphilis of the lung is another condition from which actinomycosis is to be differentiated. In syphilis, the fibrosis of the lung is slower in its development and presents a fan-shaped shadow, radiating outward from the hilus. Considerable lung markings may be present, with few clinical symptoms, while in actinomycosis, the patient has severe dyspnea, fever, loss of weight, and suffers considerable distress. A gumma of the lung, with surrounding fibrosis, may simulate very closely an actinomycotic abscess, but, again, the clinical symptoms are very different and the Wassermann test should clear up this point.

There should be no confusion between malignancy of the lung and actinomycosis. A malignant mass, regardless of its size, is clear-cut in outline, as contrasted with the irregularity of any sort of pulmonary abscess.

Actinomycosis differs from tuberculosis in that it usually involves the lungs from

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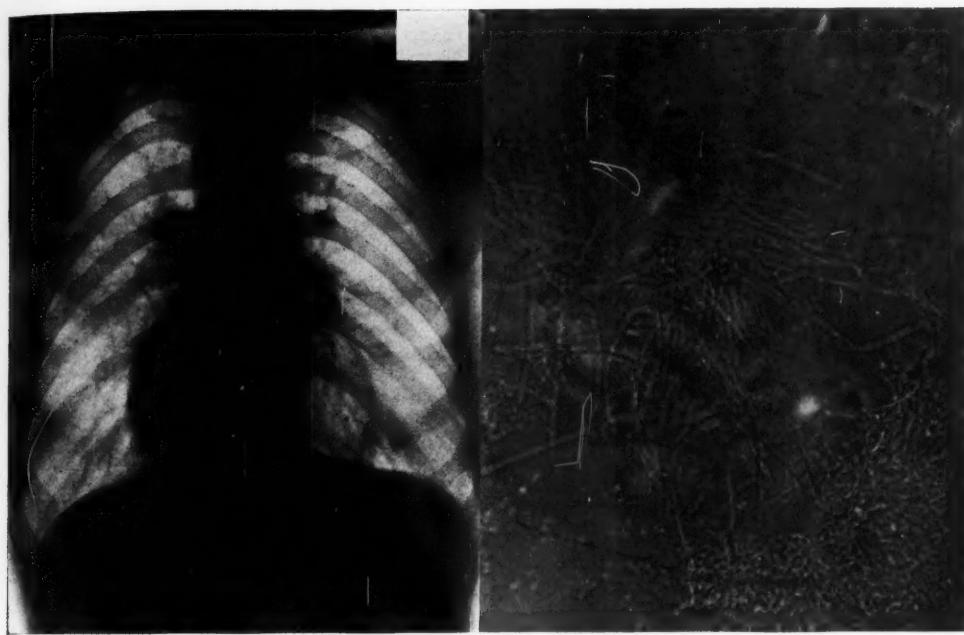


Fig. 2. (A) Radiogram showing wall of mass with center empty. (B) Photomicrogram showing detailed structure of mycelia.

the hilus downward, while tuberculosis usually extends from the hilus upward. Tuberculosis may involve the hilus areas but it does not involve the bronchi and continue as an uncontrolled bronchitis, as does actinomycosis. The large abscesses of actinomycosis resemble in no way the tiny nodules of miliary tuberculosis, and are not so numerous as the larger nodules of the ulcerative type. The fibroid type of tuberculosis may very closely simulate actinomycosis, but the absence of tubercle bacilli in the sputum and the presence of ray-fungus clears the diagnosis.

While actinomycosis presents characteristics peculiar to its own form of lesion, there is nothing sufficiently distinctive to say, from an X-ray viewpoint alone, that the disease is beyond question of doubt actinomycosis. There is no disease of the lungs which requires closer co-operation of the radiologist, clinical microscopist and clinician, than actinomycosis. The diagnosis is completed when the organism is

found in the sputum; but because of the fact that the ray-fungus is frequently present around carious teeth, it might be found in the sputum and yet not mean pulmonary infection. If there is X-ray evidence of actinomycosis, together with the presence of the organism in the sputum, the diagnosis is certain.

I wish to say here that the demonstration of the organism in the sputum is not an easy matter, and is more than likely to be overlooked in the ordinary routine examination. It appears as small, grayish-yellow granules, intermingled with mucus, pus cells, possibly blood, and not readily seen. The sputum from any individual having a continued and stubborn bronchitis, in which no tubercle bacilli can be demonstrated, should be regarded as a possible actinomycotic infection and should be studied especially for ray-fungi. A satisfactory method of search for these organisms is to mix the sputum in a Petri dish with physiologic salt solution; then by teasing apart the mucous



Fig. 3. (A) Radiogram showing no remaining evidence of a mass but greater prominence of hilus and bronchi. (B) Photomicrogram showing chain formation of spores.

threads, the pin-point granules can be separated from the pus and mucus. These small granules can then be picked up with a platinum loop, placed on a glass slide, covered and slightly crushed with a cover-glass. The low power of the microscope will show the mycelia radiating from a central mass, together with the characteristic clubs, if these be present. The presence of club-ends of the rays is not usual in human infections. These bodies are water-soluble, which is, likely, the reason for their usual absence. It is probable that a rather large number of pinhead-appearing masses will be selected from the sputum before one is found to be ray-fungus. Small particles of tough mucus so nearly resemble the tiny granules that it is impossible to tell the difference, until placed under the microscope. The filaments of the organism are composed of a sheath filled with homogeneously staining protoplasm. The protoplasm tends to segment, thus causing the filament to appear as a chain of rods. As the organism grows

older upon artificial media, or when the conditions of growth within the patient become more adverse, due to treatment, the segments of the filaments will be so short as to give the appearance of a chain of streptococci to the filament. These chains may be scattered through the sputum and present the appearance of a pure streptococcal infection.

REPORT OF A CASE

E. H. N., male, aged 38 years, was well until about the first of April, 1925. His illness began with a severe attack of dyspnea, experienced after climbing a flight of stairs rapidly. During the following few days, he experienced frequent attacks of dyspnea, which soon became continuous. He developed symptoms of severe bronchitis—profuse expectoration, with frequent paroxysms of asthma. The asthma was at times so severe as to require the frequent administration of adrenalin. His temperature ranged from 99 to 102; there was a

gradual loss of weight and periodical profuse sweating. His leukocyte count ranged from twelve to eighteen thousand. The Wassermann test and urinalysis were negative. His sputum was repeatedly examined for tubercle bacilli and none found. He grew progressively weaker. Extensive protein sensitization work was done and foods to which he was sensitive were eliminated from his diet. The sputum showed a heavy mixed infection at each examination, and autogenous vaccine and sputum filtrates were prepared. He received iodides at intervals but not to the point of toleration. During the summer he was given five X-ray treatments over the chest; following each treatment, his temperature returned to normal and he was free from asthma for two weeks. After two weeks, his symptoms began gradually to return and were very soon as severe as before he had taken the treatment. About the first of September, the patient left Chicago in quest of climatic improvement, going first to Atlantic City, where he improved for a few days, but it soon began to rain and grow cold and his symptoms returned. He then went to Jacksonville, Florida, where the climate was sultry and moist, which seemed to make him worse, so he went to Asheville, North Carolina. It was rather cold and rainy there, and he returned to his home in Chicago about the thirteenth of September. He came to El Paso the twenty-fifth of October.

The first X-ray film of which I have a record was made September fourteenth. It showed a marked thickening of the hilus, with fibrosis radiating along the larger bronchi, much more marked in the lower half of the lungs. In the right lower lobe just above the diaphragm, at its middle

point, was a round, dense shadow, presumably a small abscess. The diaphragm was fixed to the chest wall laterally, with marked diminution of excursion as shown by the fluoroscope. Air entered each apex fairly well, though the entire lung ventilation was poor. Sputum examination showed a profuse amount of yellowish-muco-purulent, very tenacious sputum. It contained muco-purulent plugs from the larger bronchi, some of which were as large as 10×30 mm. It also contained branching casts of the smaller bronchi. Charcot-Leyden crystals were present in abundance, after it had stood for a few hours. The plugs and casts were mixed with a thick yellowish pus, in which were embodied the small pin-point granules of ray-fungus.

A radiogram made on October thirtieth showed the round, dense area of the September fourteenth film to be crescent in shape, as if the abscess had emptied into a bronchus. Bronchial fibrosis was more marked and the diaphragmatic condition was unchanged.

A radiogram made November twelfth was not widely different from the one of October thirtieth, except perhaps a little less shadowing around the abscess-area.

CONCLUSIONS

1. An early diagnosis, which is essential to a cure, can be accomplished only through complete co-operation of X-ray, laboratory and clinical facilities.

2. Any continued chest-infection in which there is no evidence of tuberculosis, should be considered as a possible ray-fungus infection, and the sputum and X-ray plates studied with this in mind.

LYMPHOBLASTOMA¹

ITS GASTRIC MANIFESTATIONS, WITH SPECIAL REFERENCE TO THE ROENTGEN FINDINGS

By GEORGE W. HOLMES, M.D., RICHARD DRESSER, M.D., and JOHN D. CAMP, M.D., BOSTON

THIS study is based on eight cases of lymphoblastoma of the stomach observed at the Massachusetts General Hospital, and a review of the literature.

In all but one of the cases reviewed or examined, the roentgen findings were either negative or inaccurately interpreted. Had the clinical and roentgen findings been correlated and interpreted in the light of the known pathology of this disease, a correct diagnosis could have been made in a greater percentage of the cases.

Clinically, it is extremely difficult to differentiate the various forms of lymphoblastoma which are described in the textbooks on pathology. The histologic classification of this group is far from settled. The cases showing involvement of the stomach which have been collected from the literature may be classified under three headings: (1) lymphogranulomatosis (Hodgkin's disease), (2) pseudoleukemia, and (3) lymphosarcoma. Recently there has been a tendency among pathologists of wide experience to consider these various conditions as different manifestations of the same pathologic process.

The term "malignant lymphoma" as a synonym for lymphoblastoma has been used in the Department of Pathology of the Massachusetts General Hospital. Thus, reports are made of "malignant lymphoma" without special subdivision as to type. But in reviewing the literature, as different authors have used different subdivisions, the reported cases are recorded herein under the term applied by the authors.

Lymphogranulomatosis (Hodgkin's disease).—Cases given this name have been described by Sternberg (13). He believes, from microscopic examination of the lesions, that the condition is a well charac-

terized affection of the lymphatic system belonging to the infectious granulomas.

Although the literature contains reports of many cases given the name of lymphogranulomatosis, there are only 22 recorded cases (1-19) in which involvement of the gastro-intestinal tract was reported. Of the 22 cases collected, the stomach was involved in 12.

The gross pathologic picture varies from small thickenings of the mucosa to large, infiltrative, ulcerative lesions, which invade the muscularis, and which may continue to perforation. Only by a microscopic examination can the ulcerative lesions be distinguished from gastric carcinoma. The condition is usually a part of a general lymphatic involvement, and only infrequently is the disease localized in the gastro-intestinal tract and mesenteric lymph nodes.

The disease is generally found in the cancer age, although one case was observed in a child of five and a half years (7).

The clinical course of most cases in which ulceration predominates is marked by rapid loss of strength, emaciation, fever, and the advent of abdominal symptoms, vomiting, and diarrhea with blood in the stools. Characteristically, these symptoms continue up to the time of exitus, which is generally only a few weeks later.

Cases with solitary, tumor-like infiltrations, with little ulcerative change, present a variable clinical picture. There may be symptoms of stenosis, *viz.*, constipation alternating with diarrhea. Remissions are frequent, and the disease may be prolonged for many months.

An erroneous clinical diagnosis of ulcerative enteritis, tuberculosis, gastric ulcer, or carcinoma is nearly always made.

The roentgen findings in the cases reviewed are very meager. Only four patients were examined after the ingestion of an opaque meal. In two (2, 9), an abnor-

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mality of the stomach was noted, but could not be interpreted. In a third case (14), a circular filling defect of the pars pylorica was observed, and a roentgen diagnosis of carcinoma was made. The fourth case (6) showed pyloric stenosis, with niche formation, which led to the diagnosis of "gastric ulcer (possibly malignant)."

A large majority of these cases have come to operation, an attempt generally being made to resect the diseased area, and the mortality has been high. In only one instance of the cases reviewed (14) did surgical intervention prove successful. In this case, the patient recovered from the operation, and was well and apparently free from disease a year later.

Pseudoleukemia (pseudoleukemia gastro-intestinalis).—This form of lymphoblastoma is anatomically identical with leukemia, the differentiation being made by the blood-picture. Of the 13 gastro-intestinal cases (20-26) thus far reported in the literature, the stomach was involved in all.

The process is usually part of a general glandular enlargement. In a typical case, the mucous membrane of the stomach is thrown into great loose folds, which have been likened to cerebral convolutions. There may be polypoid formations of various sizes. Ulceration is generally absent, or very slight. The muscularis is not involved.

The age of occurrence is from 40 to 60 years, and the disease is more common in men than in women. It generally runs an afebrile course, and in about one-half of the cases there are no symptoms pointing to gastric involvement. As with lymphogranulomatosis, the correct diagnosis is generally made by the pathologist.

In this group, there are also few roentgen data. In one case very completely reported by Briggs and Elliott (20), the gastric examination showed the stomach to be small, with irregularity of its outline. Peristalsis was absent on both curvatures of the pars pylorica. The diagnosis lay between gastric carcinoma and syphilis. At operation, the appearance was that of inoperable carci-

noma. The pathological diagnosis was aleukemia, a synonym for pseudoleukemia.

Lymphosarcoma.—The pathology of this condition was first clearly described by Kudrat (27). Involvement of the gastro-



Fig. 1. Roentgenogram of Case 1 (270861), showing the irregular filling defect of the pyloric region, produced by malignant lymphoma of the stomach.

intestinal tract is fairly common, and a complete review of the extensive literature on the subject will not be attempted. The condition is generally found in young individuals. The stomach may be the site of a well-circumscribed or diffuse tumor, located at the pylorus or on the curvatures. The differentiation from carcinoma is, as a rule, difficult. The gastric involvement is not infrequently a part of a generalized disease.

Material studied.—Of the eight cases of lymphoblastoma of the stomach observed (Table I), in only one was a diagnosis made before a pathologic or surgical examination. In six of the cases, enlargement of the peripheral glands was absent, or so slight that the presence of lymphoblastoma was not suspected clinically. In one case, general peripheral glandular enlargement was present, and the diagnosis was made from tissue removed by a biopsy. The gastric symp-

RADIOLOGY

TABLE I

No.	Gastro-intestinal Symptoms	X-ray Findings	Surgical Findings	Pathologist's Report
216842	Some difficulty in swallowing for 4 weeks. No other G.i. symptoms.	Stomach and duodenum negative (4 mos. before death).	Not operated on.	Autopsy 4 mos. following discharge from hospital. Ulcerating lymphocytic area in stomach one-half in. in diam. Enlargement of mesenteric glands.
208740	Epigastric distress and gas 7 mos.; epigastric pain p.c. 5 mos.	Irregular filling defect and narrowing of antrum of stomach. Irregular and sluggish peristalsis.		
237176 239117	None until acute onset of severe abdominal, and symptoms of general peritonitis.	Negative (3 months before death).	Not operated on.	
238298	Epigastric pain p.c. 8 wks. Vomiting in A.M. of food eaten day before. Gas.	Annular filling defect in antrum. Practically complete obstruction. Dilated stomach. Sluggish peristalsis.	Annular growth three-quarter inch above pylorus. Adjacent glands enlarged.	Tumor extending about stomach in irregular manner from 2 cm. above pylorus for a distance of 5 cm.
270861	Diarrhea 4 mos. Epigastric distress; loss of appetite. Self-induced vomiting p.c. 6 wks.	Irregular filling defect in antrum. Small 6° residue. Barium enema negative.	Large tumor pyloric end of stomach, with many enlarged glands.	Irregular tumor growth superficially ulcerated 8 X 4 cm.
13723	Two mos. epigastric distress. Gas; loss of appetite; 14 lbs. weight loss. One yr. post-operative pt. well. No G.i. symptoms. Weight normal. Physical exam. negative.	Irregular deformity of antrum involving both curvatures, also first portion of duodenum. Rapid emptying of stomach.	Ulcerating tumor mass on lesser curvature at pylorus about 2 1/2 in. in diam. Very adherent to liver and perforated at one area, about 1 in. in diam. Tumor rather soft and flexible. No glands.	Ulcerating tumor mass 13 cm. diameter involving lesser curvature and posterior walls. Large, irregular, flat, superficially ulcerated and 7 cm. in diameter. Overhanging and sharply raised edges.
4683	Pain in stomach for 3 mos. Relieved by food. No vomiting. Following X-ray treatment gas-tric symptoms markedly relieved.	Irregular filling defect lower third of stomach involving curvatures and posterior wall. No stasis. Following X-ray treatment, filling defect much smaller; curvatures smooth, peristalsis present. Remaining defect all on posterior wall.	No operation.	Biopsy: cervical gland malignant lymphoma.
Mr. L.	Data incomplete	Annular filling defect at pylorus, with marked obstruction.	Annular tumor involving pylorus.	Malignant lymphoma.

toms in this case were a late manifestation. In one case, in which the roentgen findings and pathological specimens were available, the clinical data were meager.

The following three cases, reported in detail, illustrate the type of cases studied:

Case 1 (270861).—A man, aged sixty-one, complained of diarrhea and anorexia. The past history was negative. Four months before admission, he began suddenly to have frequent, loose bowel movements, with occasional intervals of constipation. For six weeks, he had considerable epigastric distress after meals, and obtained relief only by self-induced vomiting. The vomitus was of a reddish-yellow color. He had lost his appetite and much strength. His weight had dropped from 150 to 122 pounds in four months.

Physical examination.—The physical examination revealed a pale, emaciated and dehydrated old man. The chest and heart examinations were negative. In the left epigastrium, which was tender and rigid, there could be felt a slightly movable mass about the size of an orange. No enlarged peripheral glands were felt. A blood examination showed: hemoglobin, 60 per cent; red blood count, 4,416,000; white blood count, 10,200; polymorphonuclears, 78; lymphocytes, 18; large mononuclears, 3; reds and platelets, normal.

The *roentgen examination* of the stomach showed a constant, irregular filling defect at the outlet of the stomach (Fig. 1), and a small, six-hour residue. These abnormalities were thought to be due to carcinoma. An examination of the colon by means of a barium enema was negative.

Operation.—The patient was operated on three days later, and a large tumor of the pyloric end of the stomach, adherent to the pancreas, with enlargement of the regional lymph nodes, was found. The lower third of the stomach was excised, the end closed, and a posterior gastro-enterostomy made. The patient was in shock following the operation, and died a few hours later.

Pathological examination.—“Specimen submitted of pyloric region of the stomach

measuring 7 cm. along the greater curvature. There is a portion of omentum attached in which no enlarged lymph glands can be found. On section the stomach contains an irregular, superficially ulcerative



Fig. 2. Gross pathological specimen of Case 1 (270861). Superficially ulcerated tumor mass from pyloric end of stomach.

growth 8 cm. long and 4 cm. in its widest portion [Fig. 2]. It is shaped like the wings of a butterfly, with narrow neck at the pylorus and wide expansions on both sides. On section of one margin, the exposed portion is translucent, white and homogeneous. Microscopic: gastric wall diffusely invaded by small atypical cells of the lymphocyte series. There is no fibrosis [Figs. 3 and 4]. Diagnosis: malignant lymphoma.”

In this case, the disease was confined to the stomach, which exhibited a well-defined tumor mass simulating carcinoma clinically, grossly, and roentgenologically. Four other cases examined were of this type. In none of these was a correct diagnosis made before a surgical or pathological examination.

Case 2 (216842).—A man, aged thirty years, complained of persistent, dull, lower-back pain, of seven months' duration. The onset was gradual, and the severity of the pain had increased. Two months before

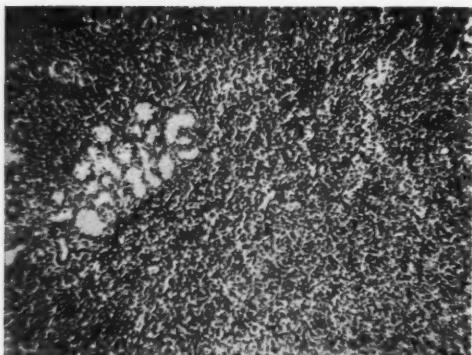


Fig. 3. Microphotograph of pathological specimen, Case 1 (270861). Diffuse infiltration of the gastric wall by small atypical cells of the lymphocyte series.

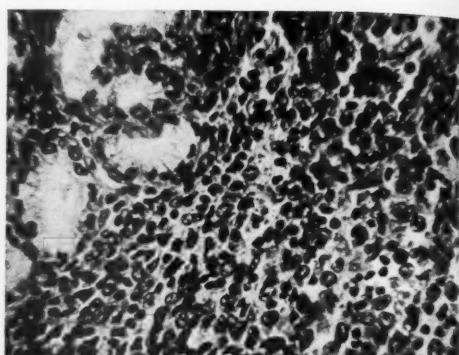


Fig. 4. Microphotograph (high power) of pathological specimen, Case 1 (270861). Diffuse infiltration of the gastric wall by small atypical cells of the lymphocyte series.

admission, he began to complain of gas in the stomach, and bloating of the abdomen. For four weeks, he had some difficulty in swallowing. One week prior to his entry, his physician felt an enlarged lymph node in the left axilla, and a mass in the upper abdomen.

Physical examination.—The physical examination at the hospital showed, in addition, a questionable enlargement of the liver and spleen. It was otherwise negative.

The *roentgen examination* of the gastrointestinal tract was negative. A definite clinical diagnosis was not made. The symptoms were not thought sufficient to justify surgery, and the patient was discharged to his local physician. Four months later he died. An autopsy was performed outside the hospital and the specimens sent to the hospital for examination.

Pathological examination.—The pathologist reported a "malignant lymphoma" involving the stomach, mesentery, and lymph nodes. The piece of stomach received presented grossly a round loss of substance in its inner aspect about one-half inch in diameter, which was bordered by a whitish layer of tissue a few millimeters in thickness replacing the stomach wall. The spleen showed infiltration with atypical cells of the lymphocyte series, irregularly distributed; also an increase of interstitial tissue.

This case illustrates the limited gastric involvement present in some cases. In the group illustrated by this case, the changes are limited to small, ulcerative areas of lymphocytic infiltration of the gastric wall, which seem to be gastro-intestinal manifestations of lymphoblastoma. Two of our cases were of this type. In neither was a correct diagnosis made clinically, and the roentgenologic findings were negative in each case.

Case 3 (9263).—A woman, aged sixty-four, had been receiving roentgen-ray treatment for enlarged peripheral lymph nodes, which were proved after a biopsy to be "malignant lymphoma." She had never vomited, or passed any blood.

A roentgenologic examination showed an irregular filling defect involving the lower third of the stomach. The irregularity was most marked when pressure was applied, and, under such conditions, a rounded mass suggesting an ulcerative area could be seen on the posterior wall. The lesser and greater curvatures in the lower third were irregular in outline, and peristalsis was absent over the involved area. There was a small retention from the six-hour meal.

As the patient was known to be suffering from lymphoblastoma, it was suggested that the changes in the stomach might be due to this disease. Short wave roentgen radiation was applied to the abdomen in divided

doses. The patient's gastric symptoms became very much less marked, and a second roentgenologic examination of the stomach was made two months after the first. At this time, the filling defect previously noted had diminished in extent, and, unless pressure was applied to the suspected area, the abnormality could not be demonstrated. The curvatures previously irregular were now smooth, and peristaltic waves passed over them without interruption.

ROENTGEN FINDINGS

The roentgen findings are not sufficiently characteristic to permit of a specific diagnosis of lymphoblastoma of the stomach, but, when taken with the clinical findings, may be of considerable value. In the generalized form of the disease, particularly in its early stages, the roentgenologic examination may be negative. It is obvious that until the infiltrative areas become extensive enough to produce tumor-formation or ulceration no definite roentgen evidence can be obtained. In two of our cases, the findings were negative, although both showed abnormality of the stomach at a later period. It is quite possible that at the time the examination was made the lesion had not developed either tumors or ulcers. In this type of case, the only evidence likely to be found is abnormal gastric peristalsis.

In the cases with well developed tumors localized in the stomach (five of which are reported in this series), the findings were: sluggish, irregular peristalsis, which did not pass over the region of the lesion; a filling defect, usually annular in type, and gastric stasis. The pyloric region was most often involved, and there was generally stasis present. All but one of our cases showed evidence of gastric stasis, the amount varying considerably. All showed an annular filling defect, and irregular peristalsis.

The roentgen appearance did not differ from that of carcinoma, except that in some of the cases the peristalsis was not interfered with to the extent generally seen in

carcinoma. The conclusions based on the roentgen findings were carcinoma in five cases, and lymphoblastoma in one. Two cases were considered negative. In no case was the lesion confused with ulcer. In the single case correctly interpreted (Case 3), the clinical, roentgenologic and laboratory data were carefully studied before making a definite diagnosis.

SUMMARY

Eight cases of lymphoblastoma of the stomach, with roentgen studies of the gastrointestinal tract, are reported.

Two more or less distinct types corresponding with the gross pathology as described in the literature were observed.

In general, the gross manifestations of lymphoblastoma of the stomach may be divided into two types: (1) that in which the gastric involvement is coincident with a generalized involvement of the gastro-intestinal tract, and (2) that in which the stomach alone is involved. Either of these types may or may not be associated with peripheral lymph node enlargement.

The roentgen findings were either negative, or closely simulated those of gastric carcinoma.

The possibility of the presence of this disease in all atypical cases showing carcinomatous-like deformities should be considered.

The localized type of this disease should respond well to irradiation therapy, or to a combination of irradiation and surgery (Cases 13723 and 4683).

BIBLIOGRAPHY

1. CATSARAS, J., and GEORGANTAS, B.: Concerning a case of isolated Hodgkin's granuloma of the ileocecal valve. *Virchow's Arch. f. Path. Anat. u. Phys.*, 1914:216:107-116.
2. EBERSTADT, F.: A case of isolated malignant granuloma of the small intestine and mesenteric lymph glands. *Frankfurter Ztschr. f. Path.*, 1914:15:79-88.
3. FABIAN, E.: Lymphogranulomatosis (Paltau-Sternberg). *Centralbl. f. allg. Path. u. Path. Anat.*, 1911:22:145-186.
4. DEGROOT, JR., J.: Lymphogranulomatosis Intestini. *Frankfurter Ztschr. f. Path.*, 1922:26:382-400.
5. HESS, L.: Concerning the blood findings in diseases of the lymph glands. *Wien. klin. Wchnschr.*, 1907:20:1352-1361.

6. KAZNELSON, P.: Concerning a case of niche formation and pyloric stenosis following lymphogranulomatosis of the stomach. *Wien. Arch. f. inn. Med.*, 1923:7:117-122.
7. LA ROY, L.: A pathological and anatomical study of tuberculosis simulating pseudoleukemia. *Arch. internat. de chirur.*, 1907:3:603-636.
8. LICHTENSTEIN, A.: Investigations concerning the etiology of lymphogranulomatosis. *Frankfurter Ztschr. f. Path.*, 1921:24 (suppl.): 529-635.
9. NOVOTONY, A.: Lymphogranulomatosis of stomach and intestines. *Cas. lek. cesk.*, 1923:62:224-226.
10. PARTSCH, F.: Contributions to lymphogranulomatosis intestinalis. *Virchow's Arch. f. path. Anat. u. Phys.*, 1921:230:131-138.
11. SCHLAGENHAUFER, F.: Concerning granulomatosis of the gastro-intestinal tract. *Centralbl. f. allg. Path. u. path. Anat.*, 1913:24:965-966.
12. SCHLAGENHAUFER, F.: Contributions to the pathological anatomy of granulomatosis of the gastro-intestinal tract. *Virchow's Arch. f. path. Anat. u. Phys.*, 1919:227:74-86.
13. STERNBERG, C.: Concerning a peculiar form of tuberculosis of the lymphatic apparatus giving the picture of pseudoleukemia. *Ztschr. f. Heilkunde*, 1898:19:21-90.
14. STEINDL, H.: Concerning a case of lymphogranulomatosis of the stomach. *Arch. f. klin. Chir.*, 1924:130:110-116.
15. SUSSIG, L.: The recognition of the intestinal form of lymphogranulomatosis. *Medizin. Klinik.*, 1924:20:415-416.
16. TERPLAN, K.: Concerning the intestinal form of lymphogranulomatosis. *Virchow's Arch. f. path. Anat. u. Phys.*, 1922:237:241-264.
17. WARFIELD, L. M., and KRISTJANSON, H. T.: Hodgkin's disease of the intestines. *Johns Hopkins Bull.*, 1916:27:24-27.
18. WEINBERG, F.: Lymphogranuloma tuberculosum. *Ztschr. f. klin. Med.*, 1917:85:99-166.
19. ZEIGLER, K.: Die Hodgk. Krankheit, Jena, 1911. Pub. by Gustav Fischer. Pages 67-70.
20. BRIGGS, A. D., and ELLIOTT, A. R.: Pseudoleukemia gastrointestinalis. *Jour. Am. Med. Assn.*, 1924:83:178-181.
21. BUTTERFIELD, E.: Lymphocytoma with prominent lesions in the intestinal apparatus. *The Phys. and Surg.*, 1907:29:49-68.
22. HOFFMAN, M.: Concerning the clinical manifestations in gastro-intestinal pseudoleukemia. *Arch. f. klin. Chir.*, 1907:82:794-802.
23. SHOEMAKER, H.: Pseudoleukemia gastro-intestinalis. *N. Y. Med. Jour.*, 1910:91:11-14.
24. SYMMERS, D.: Certain unusual lesions of the lymphatic apparatus, including a case of gastro-intestinal pseudoleukemia. *Arch. of Int. Med.*, 1909:4:218-237.
25. SYMMERS, D.: The relationship of the toxic lymphoid hyperplasias to lymphosarcoma and allied diseases. *Arch. of Int. Med.*, 1918:21: 237-251.
26. WELLS, H. G., and MAVER, M. B.: Pseudoleukemia gastro-intestinalis. *Amer. Jour. Med. Sci.*, 1904:155:837-855.
27. KUNDRAT: Lymphosarcomatosis. *Wien. klin. Wchnschr.*, 1893:6:211-234.
28. EWING, J.: *Neoplastic Diseases*. Pub. by W. B. Saunders Co., Philadelphia and London, 1922. Pages 348-392.

RADIO-ACTIVE SUBSTANCES: THEIR THERAPEUTIC USES AND APPLICATIONS

RADIUM TREATMENT OF CARCINOMA OF THE LOWER LIP

By JOSEPH MUIR, M.D., NEW YORK CITY

AMONG the malignant lesions which are brought to the surgeon or the radiotherapist for treatment, cancer of the lip is by no means the most frequent, but because of its conspicuous position, and possibly because of a more general appreciation by the laity of its seriousness, this particular neoplasm has received more consideration than many others equally grave. At the Clinical Congress in Boston some three years ago it was stated that lip cancer constitutes from 2 to 3 per cent of observed malignant lesions; also that cancer of the lower lip is twelve times as often seen as that of the upper lip. In an analysis of lip cancer from five surgical clinics made by Brewer, of New York, it was found that of 694 cases, in 637 the disease was primary in the lower, and in 57, the upper lip; while in 35, there was involvement of both lips.

One of the most striking features of lip cancer is the sex incidence; twenty cases occur in men to one in women. This sex difference is so noticeable that one immediately looks for a definite etiologic factor peculiar to the male sex, and the majority of observers think that this has been postulated in smoking, particularly pipe-smoking. The reports from Southern clinics where negroes form a large part of the clinical material indicate that this may be of importance, for nearly all the negro women so affected were found to be pipe-smokers, the formerly much-used clay pipe being seemingly the worst offender. Brewer cites Couch as having pointed out the three most important factors in the relationship between tobacco-smoking and lip cancer, as being, first, local anemia caused by pressure of the pipe stem on the lower lip; second, the irritating effect of nicotine, and the products of combustion, carbon monoxide and carbon dioxide making with

the water of the mouth secretions carbonic acid; and, third, the direct action of heat.

Broders, of the Mayo Clinic, studied 537 cases of epithelioma of the lip and found the proportion of males to females 49:1, but his observations in regard to smoking as an etiologic factor do not correspond very exactly with those of writers from other sections of the country. After stating that his female patients numbered 11—in comparison to 526 men—he mentions that one-half the female patients do not use tobacco. Without stopping to quibble over the exactness of his estimates, we will accept his final statement that more than 80 per cent of all the cases he studied were in tobacco-users, but that only one-half of these were exclusively pipe-smokers. As occupation might well have much to do with the manner of smoking and the amount, it is of interest to note that more than half of Broders' patients were farmers, but on further consideration this becomes of less importance, in that the Mayo Clinic is the largest institution of its kind within an immense area of farming country, so that in this matter of occupation it can hardly be compared with the reports from other large clinics, as, for example, New York and Baltimore. Probably occupation has little or no bearing on the etiologic factors. Janeway reported on 24 patients, only one of whom was a woman; and she, also, was the only one who had not been an excessive user of tobacco. This writer lays some stress upon trauma as an initiatory factor in epithelioma of either lip. In one of his patients there was a history of long-continued irritation from the jagged edge of a decayed tooth, and in another, the lip had been injured by a piece of shell while eating oysters.

A very general opinion among students of this subject is that benign "pre-cancer-

ous" lip lesions are of great importance in the possible etiology of cancer in this particular region. Bloodgood has reported extensively upon this phase of the question; he states that among some 200 lesions of the lower lip seen between 1889 and 1913 at Johns Hopkins Hospital, 15 have been microscopically proved benign, and he gives it as his belief that "these lesions represent, in gross and microscopic characteristics, the lesions that the remaining 185 patients told us about as the beginning of their trouble on the lower lip." Of these benign lesions, the one most frequently encountered is *smoker's burn*, which is described as a small depressed area, of dark color and a consistency like leather, which makes its initial appearance at the mucocutaneous border of the lower lip. When examined under the microscope it will be found to be made up of epithelium, much dried and indurated, and from the epidermis beneath this growth all the sweat-glands and hair follicles will have disappeared. It is this author's opinion that injury to the epidermis of the vermillion border takes place because of the application of heat, possibly on a single occasion, but much more likely over a long period of time through repeated applications. The epidermal cells die, but are not detached, but remain to form a sequestrum which acts like a scab, across which a new layer of epithelium will grow. The patients usually say that at first there was a "scab" which was easily pulled off, but it recurred after removal, a little larger each time, until finally a definite fungus or ulcer appeared on the lip. This last manifestation will—under the microscope—prove to be carcinoma.

Two types of malignant growth are seen upon the lip—the ulcer of infiltrating nature, and the papillary wart-like growth. The first of these makes its initial appearance as an infiltration deep in the tissue, which gradually opens out in the form of a typical malignant ulcer, with the characteristic raised and indurated border about a crater in the center. The other form begins

on the surface and does not advance so rapidly as the ulcerative variety. It may persist for a long time without causing any annoyance to the patient, or noticeable infiltration of the surrounding tissue. For this reason it is more likely to be neglected than a lesion which ulcerates earlier, but the fact of its being much less malignant in a measure overbalances its chance of cure as compared with the infiltrating type, when either one comes under treatment as a fully developed malignant neoplasm.

All neoplasms in and about the mouth are fraught with the danger of early metastasis. In this respect lip cancer does not seem to be considered so likely to such extension as is cancer of the tongue or cheek, but it has been my own observation that by the time the average patient with a lip lesion goes for examination to someone competent to recognize the gravity of his condition, metastasis will have already begun, and careful palpation of the submental glands will show some degree of involvement. It has been noted by Crile that among a large number of autopsies on subjects dying from cancer of the oral region, in only one of a hundred cases was extension noted to distant parts of the body. Death had taken place because of local or regional development of the neoplasm itself, or its cervical metastases, because "the collar of lymphatics about the neck forms an almost impassable barrier through which cancer rarely penetrates; and . . . after the lymphatic stream has been blocked by carcinomatous invasion it may flow in any direction, and every sort of irregularity in the further metastases may follow, but the metastases will still remain within the accessible lymphatic collar." Within this collar, however, the lymph nodes are very numerous and well-connected, providing open routes through which the disseminated cancer cells are easily and rapidly carried, and such dissemination undoubtedly takes place very early. Bloodgood saw a lip cancer of less than three months' duration—the patient claimed he had noticed it only *three weeks*

before—where there was already metastasis to the left submaxillary lymph glands.

In treating lip carcinoma by any method, the ramifications of the lymphatic system in that region must always be borne in mind. From the lower lip the lymph drainage descends to the submental and submaxillary glands. The first of these groups lies between the anterior portions of the digastric muscle and the hyoid bone, and takes care of the central portion of the lower lip; the digastric muscle and the ramus of the lower jaw form what is known as the submaxillary triangles, at each side, and in these are found the submaxillary lymph glands which drain the outer sections of the lower lip, as well as the anterior portion of the cheek on either side. It should also be remembered that in case any damming-back of the lymph circulation occurs on either side Nature will make an attempt to utilize the channels of the opposing side for that purpose. Thus if one set of channels is infiltrated by carcinoma, drainage will continue on the other side and any treatment—whether surgical or otherwise—which aims to eliminate metastasis must be applied to the glands on both sides, no matter whether there is any evidence of their invasion by the cancerous process or not. Some operators have reported that in cases of lip carcinoma at one side, it has been the glands of the *opposite* side which were affected; those where one would most naturally expect to find extension being to all appearances wholly uninvaded.

From reasons which have been already enumerated, cancer of the lip is readily recognizable, and in most cases this can be done without resort to biopsy. At the Memorial Hospital removal of tissue is seldom deemed necessary, as a clinical diagnosis is felt to be sufficient, when concurred in by a good-sized staff of those who have had long experience in the recognition of malignant neoplasms. There are many reasons why excision for diagnostic purposes should be avoided if possible when the lip is the site of the questionable lesion, not the least of them being the cosmetic out-

come in such a prominent part of the body. The only serious source of confusion is syphilitic gumma, which can be ruled out in practically every instance by careful blood and spinal fluid tests, together with lack of response to antiluetic treatment—though of this second means of differentiation it must be said that valuable time may be lost if too much is used for this observation period.

The results of surgery in lip cancer have been much more satisfactory than in many other forms of this disease. Of Broders' series, 43 of 45 patients operated on, who reported from his total of 85 operations, were living and well, and of all who were traced for a sufficient length of time to make the results worth recording, 59.47 per cent were alive. Bloodgood found that if the surgery were sufficiently radical, so that all possible foci of metastasis were eliminated, the chances of permanent cure were excellent—33 out of 44, that is, 75 per cent, but where recurrence had taken place, the hope of final cure was greatly lessened—amounting to only about 33 per cent. Brewer divided the cases he considered into three groups, according to their degree of operability, and found that in Group I, where there was no glandular involvement at the time of operation, 66 per cent were well after five years; only the primary lesion had been removed in these cases. In Group II, where there was no demonstrable glandular involvement at the time of operation but the glands had nevertheless been dissected out, there were 93 per cent of cures; while in Group III, the patients included in which all showed metastasis to the glands at the time of operation, even wide excision had failed to bring the average of survivors after five years above 34 per cent. The figures of other writers accord pretty closely with these findings, so that in general it appears that, taken early enough, the results of surgery are likely to be good, though even in the most fortunate cases, the final disfigurement is usually considerable.

It has been cosmetic considerations perhaps more than anything else, which, early in the history of the application of radiation to malignancy, made therapists resort to X-ray and radium in an endeavor to cure lip cancer without the unpleasant after-results which attend excision of the malignant tissue. Yet an examination of the literature does not reveal that very much has been written about the radiation of lip cancer, and if one were to judge by this alone the impression would certainly remain that surgery was the method of choice at the present day. When we come to look over what literature is to be found on the subject of radiation of lip cancer, we find a wide divergence in the methods employed as well as in the results obtained. Schreiner and Kress of Buffalo used X-ray alone in most of their work, though in dealing with the infiltrating type they made use of bare tube implantation of radium emanation at the base of the ulcer in some cases. Some years ago they used a radium pack, but did not find this efficient, and are now treating the cervical metastases by high voltage X-ray. The inoperable type, where there are fixed metastases in the neck, they regard as unsuited to radiation quite as much as to surgery.

Electrocoagulation in conjunction with radium has proved successful in the hands of Pfahler, of Philadelphia, who believes it highly efficacious in all cases seen sufficiently early. After thorough coagulation of the diseased area by means of the high frequency current he applies radiation, X-ray occasionally, but more often surface application of radium, properly screened. "If the cancer involves the entire lip, or even half the lip, such preliminary destruction by electrocoagulation is impracticable, unless one can foresee some means of closing the mouth by a subsequent plastic operation. . . . In these advanced primary cases a thorough trial should first be made by applications of radium, and if skilfully applied, good results may be expected." He goes on to say, however, that radiation is indicated in all cancers of the

lip, no matter what other treatment is used, and sufficient must be employed so that there is actual complete destruction of the cancer cells. He recommends the application of radium before operation, but suggests that the roentgen ray will serve the purpose almost equally well. He also suggests that if one has skill enough and radium enough, "all local cancers of the lip can be cured by this means. It will require more time, more skill, more patience than by the combination of electrocoagulation and radiation, but there will be more preservation of tissue and a better cosmetic result than can be obtained by any combination with surgery or electrocoagulation." He inserts 10 mg. radium needles, 1 cm. apart throughout the diseased area, leaving them in place for eight hours. Radium thus inserted invariably produces a zone of necrosis about each radio-active center, and from this necrosed area fibrous nodules will result which "will lead the untrained to suspect malignant nodules or redevelopment of the disease."

It has been the experience of Lain, of Oklahoma City, and his co-workers that "cancer of the lip is equally, and perhaps more, amenable to treatment by roentgen ray or radium than by surgery, and in most cases radiotherapy is to be preferred." He is also convinced that two or three properly timed and filtered doses of radium applied within intervals of a few days are more destructive to any type of cancer cell than the total given at a single exposure. The use of both hard beta rays and gamma rays he prefers to employment of the gamma rays alone. For cases showing only a mild degree of infiltration he uses a 10 to 20 mg. radium plaque, screened with 0.10 mm. of aluminum, applied for two or three hours. Some two weeks later this is followed by a severe reaction with "degeneration and perhaps an exfoliation of all superficial pathologic cells." Before this reaction occurs another plaque screened with brass, 0.3 mm. thick, containing an equal amount of radium, is put on for eight to twelve hours. A more powerful plaque

—100 to 160 mg. of radium screened with 2 mm. brass and a gauze pad—is applied over regions of possible metastasis for fifteen to twenty hours, sometimes repeated until the total dosage amounts to 2,000 to 3,000 mg. hours. In certain indurated or deeply nodular cancers of the lip, he uses radium needles inserted 1 to 4 cm. apart, left in place three to five hours. The results of this method are apparently good, for of 248 cases treated by all methods, and in all stages of the disease, he reports 97.7 per cent of Class I—the most favorable type—living without recurrence, though many of them have not passed the accepted time limit to be pronounced "cured."

At the Memorial Hospital, New York, lip cancer is treated by the application of radium in tubes filtered by 0.5 mm. of silver, which removes approximately 95 per cent of the beta radiation. These are held in the desired position by a mould of dental compound made to fit the lip exactly and held in place by attachment to the teeth. Usually one application of this apparatus is sufficient to effect complete regression of the growth, but in cases where there is considerable infiltration it may be supplemented by burying bare capillary tubes of glass, 3 mm. long and 0.3 mm. in diameter, containing one millicurie or less of radium emanation. These are placed under slight novocaine anesthesia by means of trocar needles. Members of the staff have seen no ill effects from leaving the capillary tubes as foreign bodies in the lip tissue, but think it wise always to make the surface applications at the outset, as the possibility of dissemination of the cancer cells through trauma in placing the tubes, they feel, must always be considered, even though they regard it as remote. Areas of existing or possible metastasis in the neck are treated either by X-ray or radium packs—sometimes by combination of the two. "In those cases having no palpable nodes this has been with the idea of stimulating the protective defences in the lymphatics and destroying minute metastatic foci at a

time when they are of least proportions." Quick reported that of 115 cases of lip cancer so treated which they had been able to trace, 80, or 69.5 per cent, were free from disease, the average period of time which had elapsed being 18 months, though some had remained free for more than four years.

Heavily screened surface applications of radium element have given good results in the cases of lip cancer treated by Montgomery and Culver, of San Francisco. Though they sometimes used needles, these were always arranged on a screen as a plaque applicator and were never inserted. They have never used radium emanation, either buried or otherwise. Twenty hours is their usual allotment of time and this is not varied, whether twenty-five milligrams or one hundred and fifty are put in use. The screenage consisting of one to two millimeters of lead and two to four of rubber has been found the most satisfactory, the thickness of the screen being proportioned to the amount of infiltration presented by the lesion. Plaques and tubes are often used interchangeably. It is the practice of these operators to irradiate vigorously over the immediate lymphatic drainage area during the time the lip lesion itself is being treated.

Another California radiologist, Laurence Taussig, follows more closely the practice of the Memorial Hospital, using intensive surface radiation, applied to the lip by the mould of dental compound, but placing his chief dependence on buried radium emanation, placing about four bare capillary glass tubes directly in the malignant tissue. In his opinion this "is the method of choice in treating many types of tumors, usually in conjunction with some type of surface radiation. The tubes . . . are so small that there is but little foreign body reaction, though at times they cause little fibrous nodules that are difficult to tell from remaining cancer tissue. They permit of an even radiation of the depths of the growth." He considers that the fact that radium causes no loss of normal tissue—

which is inevitable when surgery is employed—is one of the greatest advantages in its use.

This review seems to me to bring out several very important drawbacks to the

of the zone of necrosis which forms about the "bare seed," and the removal of the radio-active center when its work is completed, eliminates all question of foreign body reaction.

It is imperative to give attention to any possible or already existing metastases to the cervical lymph nodes at the same time, or even before the implantation of the removable seeds is undertaken. This is best accomplished by deep roentgen-ray applications to the submental and submaxillary glands, and such radiation should under no circumstances be neglected, no matter whether an implication of these glands is evident upon palpation or not.

The number of seeds required to treat a given lip lesion adequately will, of course, depend upon its size, both as regards surface extension and depth of infiltration. In general, it may be said that the seeds should be placed two centimeters distant from each other, and the depth of the lesion so gauged by careful palpation that the radiation of one centimeter in all directions from each seed will reach even the most remote of the infiltrated tissues. The seeds are put in by means of a special implanter and when left in position the thread attached to each one will protrude through the point of entrance where the seed was thrust into the tissue. The thread is then cut off so as to leave only enough to permit ready grasping with forceps when the time for removing it arrives. The period of exposure is usually ten days—depending, of course, upon the concentration of the seeds. Any chance of necrosis-formation is avoided by keeping the amount of contained radium emanation down to 3 millicuries, which is considerably below the amount necessary to produce necrosis with the thickness of platinum filtration provided, as has been shown by the experimental work of Lacassagne.

The accompanying diagrams show the instrument used for implantation of the seeds, and a schematic representation of the extent of the radiation from each seed after implantation. In Figure 1 three seeds

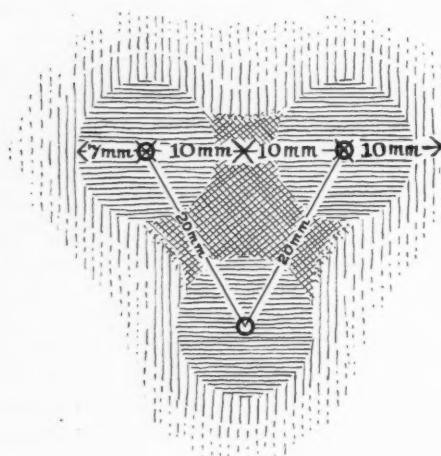


Fig. 1.

use of radium in lip cancer, chief among which are the difficulty of adequately irradiating a deeply infiltrated lesion by surface applications which are properly screened to prevent severe reaction and necrosis of tissue; and the danger and discomfort attending implantation of unfiltered tubes which must remain permanently in the tissues, not only offering all the objections of foreign bodies but eventually causing the formation of nodules which greatly increase the difficulties of correctly diagnosing any return of the malignant condition.

Fortunately, it is now possible to obviate all these drawbacks and at the same time retain all the advantages which radium treatment had heretofore offered. This can be done by the employment of removable platinum-radon seeds, which can be placed in the malignant lip tissue as deeply as is desired, and when the appointed period of exposure has been accomplished, are withdrawn quickly and easily, leaving nothing to form the objectionable fibrous nodules, for the platinum filtration with which each seed is equipped prevents the occurrence

are shown placed as at the apices of an equilateral triangle, the sides of which are 20 mm. in length. This arrangement provides for complete radiation of all tissue within a radius of seven millimeters of each

central spaces, show the extent of tissue subjected to cross-fire radiation by the gamma rays. The vertical lines indicate the peripherally diminishing gamma radiation.

In Figure 2 are shown the special im-

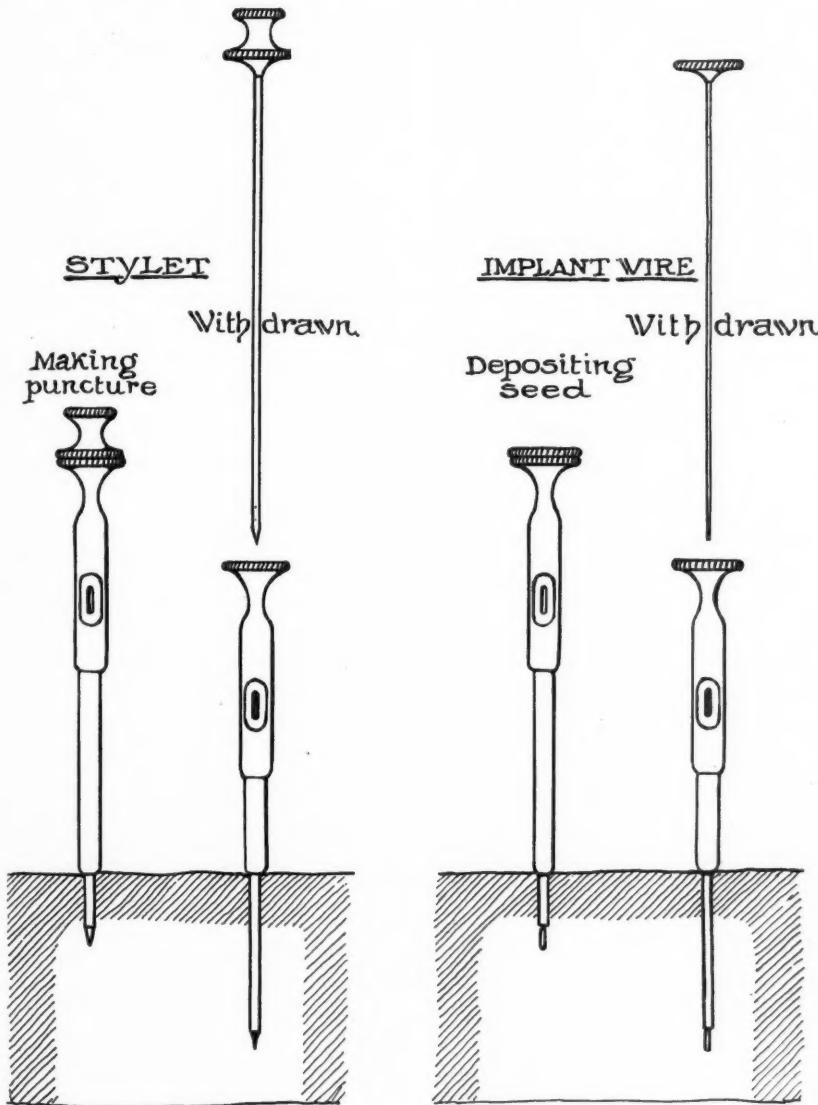


Fig. 2.

seed. The diagram shows by means of horizontal lines the areas within which tissue change takes place, while those areas indicated by cross-hatching, occupying the

plantation instruments by means of which the removable platinum-radon seed is placed in position. Two lengths are shown—one for placing the deep seeds and the

other for implantation nearer the surface. The design is identical except that the depth at which the seed can be placed is limited, so that all "guess-work" in implantation is done away with. The tissue is punctured with the stylet in place; the stylet is then withdrawn, leaving the instrument at the exact depth at which it is desired to place the seed. The seed is next placed in the loading slot and driven down by the insertion of the implant obturator, so that it is deposited at a predetermined point in the malignant tissue. The thread attached to the seed is drawn after it through the lumen of the implanter, and when the implanter is withdrawn the thread remains in the channel made by the insertion of the instrument, its end hanging out of the portal of entry. It is then cut off, leaving just enough to be grasped with forceps when it is desired to remove the seed. The technic is very simple and the patient suffers no pain either during implantation or removal.

In this new technic we feel that we have a safe, adequate and highly satisfactory method of applying radium to malignant lesions of the lip. From the patient's point of view, it is far superior to the encumbering mould of dental compound and the repeated dosage, which some of the radiologists whose work has been examined consider of such importance. It is my personal opinion, and this is backed up by that of some of the foremost experimenters and clinical employers of radium in this country and abroad, that repeated dosage under any circumstances is highly undesirable, as it renders the tissues reached at the initial applications so radio-resistant as to impede the action of the rays upon the deeper structures which are not reached at

the original radiation. The implanted platinum-radon seed accomplishes the maximum amount of radiation at a single application, and, with its removal, the treatment is completed in a manner never possible when even exhausted emanation tubes must be left *in situ*. It is to be hoped that the wide use of this means of employing radium for the treatment of lip cancer may soon see a marked diminution in the number of fatalities from this dreaded form of disease, and absolute abolition of the disfigurement which so often lessens the success of those procedures which are efficient in removal of the malignant focus.

REFERENCES

BLOODGOOD, J. C.: Carcinoma of the lower lip. *Surg., Gynec. and Obst.*, 18:404, 1914.

BREWER, G. E.: Carcinoma of the lip and cheek. *Surg., Gynec. and Obst.*, 36:169, February, 1923.

BRODERS, A. C.: Squamous-cell epithelioma of the lip. *Jour. Am. Med. Assn.*, 74:656, March 6, 1920.

CRILE, G. W.: Carcinoma of the jaws, tongue, cheek and lips. *Surg., Gynec. and Obst.*, 36:159, February, 1923.

JANEWAY, H. H.: The treatment of cancer of the lip by radium. *Jour. Am. Med. Assn.*, 70:1051, April 13, 1918.

LAIN, E. S.: Treatment of cancer of the lip by radiation. *Arch. Dermat. and Syphil.*, 6:434, October, 1922.

MASON, J. T.: Carcinoma of lower lip. *Surg. Clin. N. A.*, 4:1095, October, 1924.

MONTGOMERY, D. W., and CULVER, GEORGE D.: Epithelioma of the lip treated with radium. *Calif. and West. Med.*, 22:628, December, 1924.

PFAHLER, G. E.: Cancer of the lip treated by electro coagulation and radiation. *Arch. Dermat. and Syphil.*, 6:428, October, 1922.

QUICK, DOUGLAS: Radium in the treatment of epithelioma of the lip. *Jour. Radiol. (Omaha)*, 2:1, No. 11, December, 1921.

SCHREINER, B. F., and KRESS, LOUIS C.: Contribution to the treatment of cancer of the lip by radiation. *Jour. Cancer Research*, 8:221, July, 1924.

SISTRUNK, W. E.: The results of surgical treatment of epithelioma of the lip. *Ann. Surg.*, 73:521, May, 1921.

TAUSSIG, LAURENCE: Radium treatment of carcinoma of the lip. *Med. Clin. N. A.*, 6:1579, May, 1923.

ONE HUNDRED MILLIAMPERE BUCKY DIAPHRAGM TECHNIC

By E. C. JERMAN, CHICAGO

Part	Position	Kilovolts Peak	Pre-reading Volts	Milli-amperes	Distance	Time	Tube
Kidney	A.P.	65		100	25 in.	2 sec.	5-100
Stomach	P.A.	84		100	25 in.	1 sec.	5-100
Colon	P.A.	84		100	25 in.	1 sec.	5-100
Gall bladder	P.A.	76		100	25 in.	1 sec.	5-100

The above chart is based upon an average adult (150 pounds). A medium focus universal tube may be used if the 5-100 tube is not available.

To change radiographic density, vary autotransformer (pre-reading volts).

KIDNEY TECHNIC

There is a considerable difference of opinion among radiologists and technicians as to what may be the best procedure for radiography of the kidney region. However, most all have agreed that a good radiograph of this region should show the lower borders of the liver and spleen, psoas muscle lines, lateral processes of the lumbar spine, and complete contour lines of both kidneys. Sufficient penetration should be used to show a slight thinning of the kidney shadow in the region of the pelvis and calyces. There are many difficulties in the way of bringing about these desired results. The kidney shadow may be affected by movement due to respiration, peristalsis or heart action. It may be affected by the contents of the gastro-intestinal tract. It may also be affected by pathological conditions of the kidney itself or nearby organs. The kidney may be largely superimposed upon the liver or spleen. That part of the kidney which is superimposed upon the liver or spleen is more difficult to differentiate.

Preparation of the patient by means of a cathartic or enema, or both, is advised by many; others advise no preparation except in special cases.

Equipment.—A transformer of sufficient capacity, with a control of sufficiently uniform regulation to handle the amount of energy required.

Double intensifying screens are ordinarily used for this work, as the large amount of energy required would make

such work impractical without them. The use of screens also provides for additional contrast.

A time switch of tested accuracy must be used in order that the exposure time may be consistently duplicated.

A stabilizer is practically essential in order to obviate the necessity of tube testing, and to keep the milliampere factor constant regardless of the K.V.P. used.

A medium focus tube may be used for this work. The 5-100 radiator type, however, is the ideal tube.

Compression by means of a rubber bladder, air inflated, is almost universally used.

Technic.—A distance of 25 inches has been selected in the above table, as this is the usual Bucky diaphragm distance.

One hundred milliamperes has been selected in order that more contrast may be obtained with the use of lower voltages in shorter exposure time.

An exposure time of two seconds has been selected in order that the danger of movement may be lessened.

With the above factors fixed, the radiographic density is controlled by varying the K.V.P. with the autotransformer.

The K.V.P. may vary from 60 to 80, depending upon the thickness and density of the region exposed.

Position of patient, tube and cassette.

—The patient is usually placed on the Bucky diaphragm in the A.P. position. If a 14 × 17 film is used, the patient should be so placed that the kidney shadows will

appear in the upper half of the film. If a small cassette is used for one kidney, the patient should be so placed that the shadow of the kidney will appear at the center of the film. Direct the central ray from the tube to the center of the cassette at right angles to a line from the highest point of the intercostal arch to the umbilicus.

STOMACH AND COLON

The object in radiographing the stomach and colon is to show the size, shape and position of the various barium-filled areas with clean-cut, sharp contour lines, as well as the position of these various areas as related to other anatomical parts.

Equipment.—A transformer of sufficient capacity, with a control of sufficiently uniform regulation to handle the amount of energy required.

Double intensifying screens are ordinarily used for this work, as the large amount of energy required would make such work impractical without them. The use of screens also provides for additional contrast.

A time switch of tested accuracy must be used in order that the exposure time may be consistently duplicated.

A stabilizer is practically essential in order to obviate the necessity of tube testing, and to keep the milliamperes factor constant regardless of the K.V.P.

A medium focus tube may be used for this work. The 5-100 radiator type, however, is the ideal tube.

Technic.—A distance of 25 inches has been selected in the above table, as this is the usual Bucky diaphragm distance.

One hundred milliamperes has been selected in order that more contrast may be obtained with the use of lower voltages in shorter exposure time.

An exposure time of one second has been selected in order that danger of movement may be lessened.

With the above factors fixed, the radiographic density is controlled by varying the K.V.P. with the autotransformer. The K.V.P. may vary from 78 to 95, depending

upon the thickness and density of the part exposed.

Position of patient, tube and cassette.—The patient may be placed in either the standing or prone position. It may be found in the course of the fluoroscopic examination that the most desirable view is obtained by slightly rotating the patient.

The radiographic examination usually follows the fluoroscopic examination, during which time the area desired is marked on the skin of the patient. This enables the proper placing of the area desired in relation to the tube and film.

GALL BLADDER

The gall bladder is commonly considered one of the most difficult organs of the body to radiograph successfully, due to the relatively slight difference in density between it and the surrounding areas. Gallstones are generally considered as radiographing less successfully than calculi, or kidney stones, because of their composition, as they usually contain a much lower percentage of calcium or mineral salts, thereby being less opaque to X-ray light. Due to this lack of density, it is very difficult to show clean-cut, sharp outlines of the gall bladder and gallstones. Since the introduction of the dye method, visualization of the gall bladder has become, of course, much less difficult, but the shadows cast by this method are oftentimes rather faint and more or less indistinct, so that technical procedure still has an important part to play in either increasing or decreasing the diagnostic value of the resulting radiograph. Therefore, the same technical procedure is recommended in both instances.

Equipment.—Double screens are used for the purpose of obtaining more contrast with shorter exposure time.

An accurate time switch is necessary in order that exposures may be continuously duplicated.

Technic.—A distance of 25 inches has been selected in the above table, as this is the usual Bucky diaphragm distance.

One hundred milliamperes has been selected in order that more contrast may be obtained with the use of lower voltages in shorter exposure time.

An exposure time of one second has been selected in order that the danger of movement may be lessened.

With the above factors fixed, the radiographic density is controlled by varying the K.V.P. with the autotransformer. The

K.V.P. may vary from 78 to 95, depending upon the thickness and density of the part exposed.

Position of patient, tube and cassette.—

The position of the patient is prone, with arms extended over the head, and both arms and legs curved to the left to separate as much as possible the kidney, liver and gall-bladder shadows. The tube is centered to the center of the Bucky diaphragm.

Splenic disease.—Gaucher's splenomegaly is a disease characterized pathologically by large, round, oval or polygonal cells with one or more nuclei in the spleen, liver, lymph nodes and bone marrow and by the following symptoms: onset usually insidious and early in life; 67 per cent females; marked enlargement of the spleen; bronzing of the skin; marked anemia of secondary type, with leukopenia; wedge-shaped thickening of the conjunctiva; enlargement of the liver; hemorrhages from mucous membranes, and bone lesions due to infiltration of the bone with the large characteristic cells.

Its interest to the roentgenologist lies in the fact that the case reported suffered from partial destruction of the head of the femur and cavitation and erosion of the acetabulum. Roentgen diagnoses of low grade infection and neurotrophic joint were made, but pathological examination showed the lesion to be due to infiltration with the cells described.

The authors report that radiotherapy directed toward the spleen and the bone marrow has been tried and proven ineffective. The accepted treatment, splenectomy, seems to offer some slight hope of improvement. The disease is usually fatal in the final outcome, though death occurs from intercurrent infection, often tuberculosis.

C. D. ENFIELD, M.D.

Gaucher's Disease. E. H. Cushing and A. P. Stout. *Archiv. Surg.*, Feb., 1926, p. 539.

The pathologic appendix.—Nothing is more confusing than the generally accepted notion of the pathology of the appendix. The whole subject is suffused with assumption and bad logic. The paper is based on the specific examination of 500 appendices removed at the Halstead (Kansas) Hospital. A complete microscopic study of the material leads the author to the following conclusions:

1. Fibrotic changes in the appendix, no matter of what degree, are not attended by clinical symptoms.

2. The anatomic structure of appendices commonly removed under the diagnosis of chronic appendicitis shows no variation from the appendices of individuals suffering from no abdominal complaint whatsoever.

3. The minimal changes alleged to be present in cases of so-called chronic appendicitis are wholly inadequate to explain the symptoms ascribed to them, considered in the light of like changes in other organs of the body.

4. Mere alleged relief of symptoms after the removal of the appendix is not sufficient to prove that the appendix was the cause of the symptoms.

5. The vast majority of patients so operated on do not even claim relief from their symptoms.

L. R. SANTE, M.D.

An Inquiry into the Nature of Chronic Appendicitis. Arthur E. Hertzler. *Am. Jour. Obst. and Gynec.*, Feb., 1926, p. 155.

CASE REPORTS

SYPHILIS OF THE STOMACH: REPORT OF CASE

By P. B. MULLIGAN, M.D., Roentgenologist to the
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Mountain Hospital, SHENANDOAH, PA.

On September 12, 1923, a man of 28 years was referred by Dr. William J. O'Neil, of Ashland, Pa., to the Roentgenological Department of the Ashland State Hospital for gastro-intestinal study. The patient had been treated by a number of physicians in the vicinity prior to consulting Dr. O'Neil, without relief being given and without a definite diagnosis being made, and not any of them had advised X-ray examination.

Complaint.—Vomiting, and dull aching pain in the upper abdomen.

Family History.—Mother died during childbirth; father, one brother and two sisters living and well.

Personal History.—Usual childhood diseases. Patient has been in good health until present illness began. Denies abso-

lutely any venereal diseases. Spent two years in the Army during the World War and was overseas.

Present Condition.—Began three months ago with vomiting, and dull aching pain in the epigastrium. The vomiting would occur sometimes during the meal; sometimes as late as an hour after the patient had eaten. The pain, also, would come on either while he was eating or might be delayed for an hour or two. Vomiting afforded some relief. The man has vomited practically every meal during the last three months. Weight loss, thirty pounds. Has never seen any evidence of blood in vomitus or in stools.

Physical examination was entirely negative, except that the patient was very much emaciated. No palpable tumor present in abdomen; no abnormal neurological findings.

Roentgen-ray Findings.—The stomach is very small, with marked deformity of the pars media producing hour-glass formation that gives the stomach a dumbbell-like



Fig. 1. Condition before operation.

Fig. 2. Condition after operation.

appearance. The constricted area is about two centimeters long and about the thickness of a lead pencil; there was a small retention in the upper loculus at the end of six hours. The roentgen diagnosis is lues or malignancy, and although there is a negative history of venereal disease, the patient's age and lack of cachexia would seem to indicate that the condition is luetic, if the Wassermann is positive (Fig. 1).

The patient's blood was examined and gave a positive Wassermann reaction. He was sent to the Hahnemann Hospital, in Philadelphia, for treatment. He was given five weekly injections of salvarsan, and, while there was some improvement in his symptoms, his condition did not seem to warrant delay and he was operated on by Dr. A. B. Webster at the Hahnemann Hospital. An indurated, non-malignant growth was found about an inch and a half from the pylorus which narrowed the lumen of

the stomach to the size of a pencil. The indurated area was incised parallel to the long axis of the stomach and closed in the opposite direction. The patient made a good recovery and went home at the end of three weeks. All his symptoms disappeared and he began to increase in weight.

He was examined again at the Ashland State Hospital, December 21, 1925. The stomach was very small and showed a large filling defect in the pyloric end. There was no retention, the emptying time being very rapid, the opaque material leaving the stomach in a passive manner. No peristalsis was seen (Fig. 2).

The patient feels extremely well; he has regained his former weight and is free from gastric distress. He states that his stomach fills before he has eaten a full meal, but he compensates for this by eating five or six times a day.

AN UNUSUAL CARCINOMA OF THE ESOPHAGUS: CASE REPORT

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Roentgenology, Clinic of the Cornell University
Medical College, NEW YORK CITY.

The following case of carcinoma of the esophagus is reported because of several interesting and unusual features. The patient, W. H., a somewhat emaciated man of forty-five years, came to the Clinic complaining of hoarseness and difficulty in swallowing for the past three weeks. Previous to this time he had been in perfect health. He had not swallowed any caustic fluid nor had he previously had the slightest trace of huskiness in his voice. His trouble began with a slight huskiness and difficulty in swallowing. These symptoms became progressively worse, until the time of admission, when the major portion of his nourishment was taken in the form

of liquids, and there was marked hoarseness.

Physical examination showed a pale, somewhat emaciated man of forty-five. There was a hard, fixed, deep-seated mass in the lower portion of the right anterior carotid triangle. The remainder of the general examination was essentially negative. The blood Wassermann was negative.

The X-ray examination showed a smooth, annular area of constriction at the level of the lower margin of the body of the second thoracic vertebra. The gullet above was markedly dilated and formed a pouch just proximal to the lesion. The barium was seen to pass straight to the constriction without first going to the bottom of the pouch and then spilling over. A very small, irregular stream passed through the stricture. By means of swallowing air rapidly the patient was able to distend the dilated esophagus, which pushed the trachea for-



Fig. 1. Note the air-filled esophagus. The radiograph was taken after vigorous swallowing of air.



Fig. 2. A lateral view taken immediately after Figure 1. This radiograph was made with great difficulty on account of the respiratory distress. Note the tracheal rings.

ward. This caused him marked respiratory distress. By flexing the head forward

he was able to release the air, with a loud, gurgling noise, and the trachea resumed its normal position, with complete relief of the respiratory distress.

The differential diagnosis lay between a diverticulum and carcinoma. The absence of spilling over of the barium, the age of the patient, and the hard nodule in the neck decided for carcinoma.

The laryngoscopic examination showed a paralysis of the right recurrent laryngeal nerve. At esophagoscopy the point of constriction was seen. There were no bleeding or ulcerated areas. No attempt was made to pass beyond the stricture. A bit of tissue taken from this area showed squamous cell carcinoma.

The interesting features of this case are: (1) The location of the lesion; (2) the dilatation of the esophagus above; (3) the resemblance to a diverticulum; (4) the "air trap" effect in the dilated portion of the gullet.

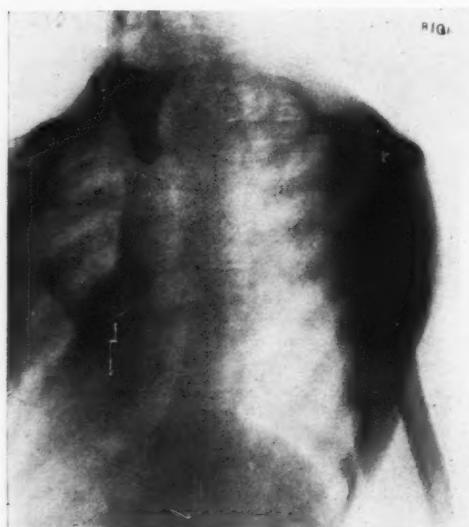


Fig. 3. Note the pouching which extends below the level of the lesion, resembling a diverticulum.

A CASE OF ABDOMINAL PREGNANCY

By ROBERT A. ARENS, M.D., and ARTHUR R. BLOOM, M.D., Roentgenologist and Assistant Roentgenologist, Respectively, Michael Reese Hospital, CHICAGO

Mrs. Z. M., aged 36, patient of Dr. L. E. Frankenthal, entered the hospital April 25, 1925, complaining of severe pain in the lower abdomen which was bearing down and drawing in character, and of vaginal bleeding. Since the latter part of February she had been suffering from morning sickness. A month later, having previously been pronounced as pregnant, pain developed in the abdomen which radiated to the

right side and across the abdomen, rendering her unable to move because of prostration. This attack was unaccompanied by fainting or dizziness.

There had been one normal pregnancy fifteen months previous to her admission;



Fig. 2. X-ray of fetus after extraction.

otherwise the past and family histories were irrelevant.

Physical examination revealed a well nourished white female who did not appear to be acutely ill. There was a decided fullness of the abdomen up to the level of the umbilicus, and dullness on percussion, more marked in the midline. The abdomen was soft, but tender. Vaginal examination disclosed a large soft tender mass to the right of the fundus. The uterus itself was enlarged to twice normal size and pushed to the left. There was a moderate bloody discharge. The temperature was 99.8° F., pulse 140, respirations 26. The blood count showed red blood cells 2,980,000, W. B. C. 20,000, with 74 per cent neutrophiles. The urine was negative and the blood pressure was systolic 110, diastolic 65.

The films of the abdomen disclosed the presence of fetal structures, the entire skeleton being clearly visible (Fig. 1). Instead of being located, however, in the pelvis as is usual in a fetus of this age—approximately four and one-half months—it lay almost in the right iliac fossa, extending above the iliac crest. The head and neck



Fig. 1. X-ray of pelvis showing skeleton of fetus in region of right iliac fossa.

back. This was so severe that it was impossible to take a deep breath or to move, and lasted three or four days. During this attack she did not vomit or feel nauseated. She had a desire to urinate, but could not.

One week prior to her entrance to the hospital, while about to go to bed, she was suddenly seized with excruciating pain in

appeared sharply flexed upon the spine, the appearance causing one to be strongly suspicious of skeletal collapse. From its size and location it appeared to be an abdominal pregnancy. Both the antero-posterior and postero-anterior films disclosed the fetal structure.

On opening the peritoneum the patient immediately went into shock. An almost black amniotic sac was seen lying free in the abdominal cavity. This was ruptured, and a macerated and partly desiccated fetus measuring 26 cm. in length extracted. The placenta was adherent to the right border of the urinary bladder, anterior and

right lateral walls of the pelvis, and right broad ligament. The right tube and ovary were embedded in a mass of placental tissue. The former, on microscopic examination, showed no abnormalities or evidence of pregnancy reaction.

This case undoubtedly is one of primary abdominal pregnancy in which the fetus had gone to about four and one-half months. It had probably been dead in the abdominal cavity for some time, as was indicated by the maceration and partial desiccation. The case is still more interesting because of the X-ray findings.

Compton effect in roentgen deep therapy.—In this paper the author presents the results of his investigations, repeating the well known experiments of Compton with a different method. He uses a photographic device by exposing to filtered and unfiltered radiation, a film which is arranged around a scattering medium. This allows the direct comparison of the absorption coefficient for various directions because the necessary measurements can be taken at the same time. The inconstancy of the apparatus (tube and transformer) will not introduce any error under this arrangement. The results of this investigation and the physical significance are discussed at length; for medical practice, the ratio of photo- and recoil electrons is given. It is stated that the biologically effective part of the radiation increases with its penetration.

E. A. POHLE, M.D.

Distribution of Quality and Quantity of Scattered Irradiation. R. Herz. *Strahlentherapie*, 1925, XXI, 110.

The cecum.—Volvulus of the cecum is rare, very few cases having been reported. The condition usually results from an abnormal mobility of the cecum due to a retained mesentery after normal developmental rotation of the colon. The pouch-like distention at times acquired by the cecum predisposes to volvulus. Other predisposing causes are: (1) Old scar formation and chronic mesenteritis; (2) Former operation; (3) Hernia; (4) Fibrous bands; (5) Mesenteric cysts; (6) Habitual constipation and chronic intestinal stasis with traction on the mesentery.

The rotation of the intestine is of three types: (1) Circular rotation with one fixed point; (2) Elliptical rotation—two fixed points; (3) Axial rotation—along the long axis of the cecum.

A case report is given in detail.

L. R. SANTE, M.D.

Volvulus of the Cecum: Report of a Case Complicating Typhoid. Henry F. Graham. *Surg., Gynec. and Obst.*, March, 1926, p. 351.

EDITORIAL

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PTOSIS

According to the dictionary, ptosis means the prolapse of an organ or part.

To-day, the radiologist, to do justice to his patient and to the branch of medicine which he serves, must be well acquainted with current medical knowledge and must keep in touch not only with his colleagues, but must have a liaison with other branches of medicine and surgery.

The influence of radiological investigations upon our knowledge of the anatomical relations and upon the motor functions of the hollow viscera in health and disease, has been revolutionary. Physiology and pathology owe much to these investigations; indeed, it is scarcely an exaggeration to say that the greater portion of our present conception of the neuro-muscular mechanism of the alimentary canal is the result of X-ray revelations.

When we remember the notions we were taught concerning the physiology of the stomach movements and what we know to-day as the result of studying the X-ray screen, the recollections cause us to blush. To-day we stand upon much firmer ground.

The position of the stomach and transverse colon, the relative position of the cecum, the appendix and flexures are now, and have been for a few years, matters of common knowledge.

Radiologists are well aware of this; however, an occasional reiteration of accepted facts is necessary because in some quarters

great emphasis is still laid upon position alone.

The variations, too, in the positions of these organs—variations which are not incompatible with good health—have been relatively recognized as normalities, because the physiology was unimpaired and the patients were symptomless.

The variability of individuals is quite as pronounced internally as externally. We are passing through the stage of incrimination on the score of disease to that of tolerance on the score of variability in individuals. Consequently our conception of what constitutes a normal standard is subject to wide latitudes.

In other words, the same thing is happening with regard to our ideas about the hollow viscera as has happened with regard to our ideas about the kidneys. At one time even a moderate degree of nephroptosis was regarded as a sign of morbidity, capable of explaining most of the functional disabilities met with in the neurasthenic, and not excluding, in the opinion of some, even grave forms of psychosis. The poor *dropped* organ was supported by pads, was "stitched up," was even removed. To-day none of these treatments is considered necessary.

Ptosis of the alimentary tract has gone through the same phases and great caution must be exercised in using this term, distinction being made between a pathologic entity and a normal variation, or much unnecessary surgery may be performed.

It is true that a colon or stomach that is low may be potentially pathologic; however, other signs, such as stasis, dilatation, atony, or symptoms of auto-intoxication must be associated with this, otherwise so-called ptosis *per se* is a negligible factor.

INTERESTING PLANS ALREADY UNDER WAY FOR THE ANNUAL MEETING

The main Auditorium will be used for the joint meeting. The commercial and scientific exhibits will be held in the Auditorium. Plankinton Hall will accommodate the daily scientific sessions. The Plankinton Hotel will be the headquarters. There are a number of pleasant rooms for the use of the committees and for the stag party. The Sky Room is a most delightful dining room, with good food and excellent music. The annual banquet will be held at the Elks Club. The members of the Society will receive in due time invitations to come to the meeting from the Milwaukee County Radiological Society, the Association of Commerce, and Mr. Walter Keenan, Manager of the Plankinton Hotel.

The meeting of the American Medical Association, held at Dallas, Texas, April 19-23, inclusive, was very well attended and made considerable addition to one's knowledge by reason of the excellent program and extensive scientific and commercial exhibits.

The Section of Radiology was definitely established, and elected its own officers. Dr. Albert Soilard, of Los Angeles, California, was elected Chairman; Dr. E. C. Samuel, of New Orleans, Louisiana, Vice-chairman, and Dr. Fred M. Hodges, of Richmond, Virginia, Secretary.

COMMUNICATION

In a recent article entitled "Ready Reference Tables for Superficial Roentgen Therapy," by H. N. Beets and Robert A. Arens, M.D., published in the May issue of *RADIOLOGY*, these authors recommend the use of a table in which the dose time is given for various spark gaps and milliamperes for both unfiltered and weakly filtered rays at a given focal skin distance,

basing their table on the former work of Witherbee and Remer.

The authors themselves, in an article published in *RADIOLOGY*, in October, 1924, state: "*The time required to deliver an erythema dose varies from one machine to another.*" In the same article Beets and Arens conclude: "*These differences have their source in the various X-ray transformers, the filters, and the tubes. It is not possible to translate dosage by the usually accepted means, i.e., P.K.V., S.T.D., ma. and time. It should be definitely discouraged, as it is highly dangerous.*" (The italics are ours.)

The latter remarks, though made in reference to deep roentgen therapy, apply to a far greater extent when dealing with weakly filtered or unfiltered rays as applied in superficial therapy, as has frequently been proven by extensive experimental work. In this connection we also refer to our recent article in the April issue of *RADIOLOGY*.

In the face of such evidence we cannot comprehend the compiling of fixed tables from which the dose time for unfiltered or weakly filtered rays for superficial or any other roentgen therapy could be deduced, excepting in instances where a given installation had been properly standardized and in which the roentgen quality and quantity of radiation, dealing directly with the X-ray bundle, is frequently determined. It is, furthermore, worthy of mention that many of the statements in the Witherbee and Remer formulae are not in agreement with present physical and clinical experience.

WILLIAM H. MEYER, M.D.,
Professor of Roentgenology,

OTTO GLASSER,
Assistant Professor of Biophysics.

The Central New York Roentgen Ray Society was formed in Syracuse, May 15, 1926. The meetings are to be held three times a year—in April, August and November. The officers are Dr. C. F. Potter,



BERTRAM C. CUSHWAY, M.D.,
President of the Society.

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Crouse Irving Hospital, Syracuse, N. Y., *President*, and Dr. D. S. Childs, 316 Gurney Bldg., Syracuse, N. Y., *Secretary*.

IRVIN H. FARR: IN MEMORIAM

Irvin H. Farr, of Holyoke, Massachusetts, aged 43 years, died at his home April 23, 1926. Dr. Farr was a graduate of Dartmouth Medical School. He served in various positions of trust in the community and on the staff of the Holyoke City Hospital, where for twelve years he held the position of radiologist. He was an active member of the Radiological Society of North America.

BYRON C. DARLING: IN MEMORIAM

We are called upon to record the death of another of our valued members, Doctor Byron Clary Darling.

Doctor Darling was born in Illinois, in 1875, and was a graduate from the Harvard Medical School in the class of 1903. He returned to the university after graduation and took special work in the then new science of radiology, in which he was later to become a leader. The greater part of Dr. Darling's medical career has been spent in the practice of radiology. He has written numerous papers and contributed greatly to the upbuilding of his chosen specialty. He has held positions in New York hospitals and served honorably during the World War in the Medical Corps of the American army. At the time of his death he was President of the American Registry of Radiological Technicians. His social popularity is evidenced by the various clubs and societies of which he was a member.

Dr. Darling leaves to mourn him his immediate family, Mrs. Sarah V. Darling and two sons, Mans Vedder and Byron C., Jr.

The Radiological Society in the death of Dr. Darling mourns the loss of a scientist

of distinction, a successful radiologist, and an honored member.

JOHN F. HERRICK, M.D.,
Chairman, Necrology Committee.

BOOK REVIEWS

IRRTUMER DER ALLGEMEINEN DIAGNOSTIK UND THERAPIE SOWIE DEREN VERHUTUNG. Edited by PROF. DR. J. SCHWALBE. Vol. IV.

IRRTUMER DER RONTGENDIAGNOSTIK UND STRAHLENTHERAPIE. Edited by PROF. DR. R. GRASHEY. Published by Georg Thieme, Leipzig, 1924.

The fourth of four volumes dealing with the errors of general diagnosis and therapy, together with their prevention. This particular volume is limited to the mistakes made in roentgen diagnosis and radiation therapy. The work is compiled under four main captions:

A. Errors of roentgen diagnosis.

There is a brief introduction by Prof. Dr. R. Grashey on the general value and limitations of the X-ray as a diagnostic agent. Among other things, the necessity of a thorough clinical examination and the danger of drawing hasty conclusions from insufficient roentgen evidence are brought out. Following these, there is a discussion, by the same author, of diseases of the bones and joints, special attention being devoted to fractures and dislocations.

The many pitfalls which one encounters in the diagnosis of diseases of the digestive organs are clearly set forth by Dr. Johannes Lorenz, in a chapter of seventy-five pages.

Diseases of the lungs, mediastinum, and diaphragm are very adequately dealt with by Dr. Alexander Lorey.

As we should expect, the chapter on the heart and great vessels is by Dr. Franz M. Groedel.

Dr. Fedor Haenisch discusses the many confusing shadows which are seen in the diagnosis of urinary disorders.

A short chapter on foreign bodies and "special regions" by Dr. Grashey concludes the section on diagnosis.

B. Errors and dangers of roentgen therapy, and their prevention.

The roentgen ray is considered from a biological and physical aspect by Dr. Hans Holfelder. The necessity of accurate dosage is emphasized, and the Holfelder method of depth dose measurement is described in some detail. The difference in the susceptibility of various tissues to irradiation is pointed out.

The X-ray treatment of gynecological conditions, benign and malignant, is taken up by Dr. Karl Reiffersheid and Dr. P. Schugt.

Skin diseases are discussed by Dr. G. A. Rost. A table is appended giving in brief form the dosage which the author employs in various dermatological conditions.

The treatment of internal diseases, tuberculosis, asthma, leukemia, etc., is by Dr. Fritz Salzmann.

C. Errors of light therapy.

A chapter by Dr. Albert Jesionek and Dr. St. Rothman on the general indications and technic of heliotherapy.

D. Errors of radium therapy.

A discussion of the dosage and application of radium, by Dr. Elis Bervan, based on the excellent work which is being done at the Radiumhemmet in Stockholm.

This book, which is really a series of brief monographs, all by authoritative men, contains a wealth of information set forth in a clear, methodical style. The text contains 259 illustrations. The authors have wisely resorted to drawings rather than to actual roentgenograms, which are sure to lose so much of their detail in reproduction. To him who has only a slight knowledge of German, the illustrations alone should be of great interest, and to him who has a fair acquaintance with the language, this book can not be too highly recommended.

R. D. DRESSER, M.D.

THE X-RAY IN EMBRYOLOGY AND OBSTETRICS. By W. A. NEWMAN DORLAND, A.M., M.D., F.A.C.S., Professor of Gynecology and Obstetrics and Head of the Department of Obstetrics in the Post-graduate Medical School of Chicago, etc.; and MAXIMILIAN JOHN HUBENY, M.D., F.A.C.R., F.A.C.P., Editor of *RADIOLOGY*, Director of the Department of Radiology of the Physicians and Surgeons Institution, etc. Octavo, 420 pages, fully illustrated. The Bruce Publishing Co., St. Paul, Minnesota.

This novel addition to the literature of roentgenology comes from the pens of two men whose competence in their respective fields is widely known. The volume contains information of great value to the roentgenologist, the obstetrician and the pediatrician. Facts gleaned from widely scattered publications and from the experience of the authors are presented in the orderly manner necessary for systematic study. An extensive bibliography appended to each chapter testifies to the thoroughness of the authors in collating their material and will be of aid to other investigators.

Subjects dealt with include the influence of X-rays on living tissue, embryonic development as revealed by the X-rays, radiography of the pelvic organs, anomalies of skeletal and visceral development, radiography of the female pelvis, pelvic contraction, normal and abnormal pregnancy, the etiologic significance of the X-ray in teratogenesis, and teratologic radiography.

The expressed pride of the writers in their collected roentgenograms of pelvic contraction and fetal teratisms seems to be quite warranted, although the latter may not specially impress the every-day roentgenologist. To him, the sections of most practical and obvious worth will be those in which the radiography of the pelvis and the X-ray diagnosis of normal and abnormal pregnancy are discussed. Certain ap-

plications of these chapters to forensic medicine enhance their value.

As a whole, the book is an admirable compendium of present knowledge in this line, deserves a generous reception, and should actively stimulate the further research which the importance of the subject demands.

RUSSELL D. CARMAN, M.D.

ULTRA-VIOLET RADIATION AND ACTINOTHERAPY. By ELEANOR H. RUSSELL, M.D., B.S., and W. KERR RUSSELL, M.D., B.S. With Forewords by SIR OLIVER LODGE, F.R.S., D.Sc., LL.D., and SYDNEY WALTON, C.B.E., M.A., B.Litt. Pages, 264; illustrations, 77. Price \$3.50. Edinburgh, E. and S. Livingstone, 16 and 17 Teviot Place. American publishers: Messrs. Wm. Wood & Company, 51 Fifth Avenue, New York.

This beautiful edition records the use of the ultra-violet light in general private practice. It is written by practical physicians. The forewords are most satisfactory recommendations by two distinguished Englishmen.

The authors recommend three sources of artificial ultra-violet light: The mercury vapor lamp, the tungsten arc and the carbon arc lamp. The great source is, of course, sunlight.

It is generally conceded that urban populations are being deprived of solar energy (ultra-violet radiation) by the unthinking pollution of town atmosphere by smoke; by the denial of sunlight by high buildings; by failure of communities to take advantage of daylight saving schedules, and the increase of night life over day life.

The authors present the historical, technical, physical, biological and chemical aspects of ultra-violet radiation and then relate their clinical experience in its application to tuberculosis, skin diseases, nutritional disorders, alimentary and respiratory diseases. The last chapter indicates the miscellaneous usefulness of the agent.

The index and bibliography are excellent. The style is distinctly of the English essay type and is especially pleasing. The conservatism of the authors is in contrast to the extravagant claims of some American writers.

This book should be read by general practitioners, surgeons, pediatricians and orthopedists. It will also serve to temper the too enthusiastic radiotherapist.

E. H. SKINNER, M.D.

SKULL FRACTURES ROENTGENOLOGICALLY CONSIDERED (Annals of Roentgenology, Vol. VI, Edited by James T. Case, M.D.). By WILLIAM H. STEWART, M.D., Roentgenologist to the Lenox Hill and Harlem Hospitals, New York City; with Surgical Comments by William H. Luckett, M.D., Directing Surgeon, Lutheran Hospital; Consulting Surgeon, Harlem Hospital, New York City. Pages 270, 83 roentgen-ray studies on 44 full page plates, 49 text illustrations. Price, \$12.00 net. Paul B. Hoeber, Inc., 67-69 East 59th Street, New York City.

This book is carried out similarly to the preceding volumes in the series, presenting the subject in a concise manner, profusely illustrated with roentgenograms and case reports, indicating the clinical side of the various lesions.

The constantly increasing number of accidents in recent years, due to the development of more rapid methods of transportation, leaves little doubt as to the growing importance of the subject and the need for publication of this book. Introductory "Surgical Comments," by Dr. William H. Luckett, call attention to this enormous increase in the number of skull fractures. Statistics are cited to show that the percentage of increase in *diagnosis* of fractures of the skull is many times what one would expect the actual increase to be, as indicated by the increase in all other types of frac-

ture. This, Dr. Luckett attributes to the perfection of diagnostic X-ray methods.

The first half of the book is given over to descriptive matter. The points of importance in roentgenographic examination; the symptomatology of skull fracture; the significance of fractures in various locations as to prognosis and treatment, all are taken up. The author then passes to a consideration of the roentgenographic technic and gives in detail the exact technic required for the examination of the skull in all views—right and left, lateral, frontal, occipital and basal. A chapter is included on the technic of roentgenographic examination with portable apparatus, since many of these patients are severely injured and cannot be moved. Detailed consideration is given to roentgenographic interpretation. A complete description of the normal is given in all of the standard views of the skull. The characteristics of various types of fracture encountered are described, and their variation from vessels and other normal markings are pointed out. All types of fracture are illustrated and roentgenographic findings indicative of depression of the fragments from the flat film are shown.

A chapter is included on the "Time Factor in the Disappearance of Roentgenographic Evidence in Fracture of the Skull." Re-examination of individuals sustaining fractures of the skull, at varying intervals after injury, was undertaken in a considerable number of cases, in an effort to determine the time necessary for the healing of the lesion and obliteration of the roentgenographic evidence of previous injury. It is obvious that this is of very great medico-legal importance and presents a question which every practitioner may be called upon to answer on the witness stand. The concrete evidence offered by the work in this chapter establishes a basis upon which such testimony can be given without fear of contradiction.

The latter half of the book is given over to cuts, illustrating the body of the text.

This volume will prove a valuable aid not only to the roentgenologist as a basis for comparison with roentgenograms encountered in his daily experience, but to the surgeon in establishing for him a more complete knowledge of the importance and effectiveness of roentgenographic examination in this particular field.

L. R. SANTE, M.D.

THE RADIOLOGICAL EXAMINATION OF THE MALE URETHRA. By G. L. S. KOHN-STAM, M.R.C.S. (England), L.R.C.P. (London). Late House Surgeon to the Urological Department, King's College Hospital, London, and E. H. P. CAVE, M.B., B.S. (London), M.R.C.S. (England), L.R.C.P. (London), D.M.R.E. (Court). Late Resident Radiologist, King's College Hospital (London). With Preface by SIR JOHN THOMSON-WALKER, O.B.E., M.B.C.M., F.R.C.S., Senior Urologist and Lecturer on Urology, King's College Hospital; Surgeon, St. Peter's Hospital for Stone, etc. A Monograph, cloth, 114 pages. Price \$5.00. Published by William Wood and Company, New York.

This is an excellent and very complete monograph dealing with the roentgenological study of the urethra and the floor of the bladder after the injection of lipiodol. The authors are to be congratulated upon presenting this subject in such a concise and clear manner.

The technic is simple and original. The injection is made by means of a simple apparatus, a Kempton tube, a conical flask and a mercury manometer, all connected by rubber tubing. Pressure is produced by using a hand-bellows which forces the lipiodol into the urethra. The resistance of the sphincter mechanism of the posterior urethra may be gauged immediately from the mercury reading in the manometer.

Films are taken while the injection is being made, first with the patient lying on the abdomen, then in the oblique position with the patient on his back. Many interesting conditions of the urethra such as

stricture, fistula and false passage can be determined from these films. In order to study the floor of the bladder the patient is placed in the Trendelenburg position with the bladder partially filled with urine or with an aqueous medium. The lipiodol is allowed to float on the fluid in the bladder thus outlining the prostate and the floor of the bladder. Thus this method is particu-

larly valuable in cases of tumor or prostatic hypertrophy, especially when there is retention of urine and a cystoscopic study cannot be made. Whether or not this method will prove to be useful in routine examinations is questionable. Its chief value would seem to be in selected cases in which urethrocopic study is not possible.

B. H. NICHOLS, M.D.

SPLINTERS FROM A BLOCK HEAD

Turn down the bright light in the dark room when loading cassettes. This is not absolutely necessary, but better radiographs will result if this rule is observed.

Remember that it takes more juice to jump a spark across a nine-inch gap than across a two and one-seventh inch gap, and that the spark from the nine-inch gap hurts more when it hits you.

Eighty-nine degrees F. is a little too warm for the temperature of the developer unless the technician likes nice thick films.

Any good sand soap thoroughly applied with a scrubbing brush will clean soiled intensifying screens. It is safe to order new screens a few days before trying this method.

If the grid of the Potter-Bucky diaphragm stops in the middle of an exposure, the resulting film should be developed without dimming the bright light, in a developer of exactly 98.6° F. temperature for at least one hour. Fixing will not be necessary.

If the wash water becomes sandy or gritty (as it frequently does in Chicago), the grit which adheres to the film after washing may be easily removed by scraping with a pocket knife blade. If this is not at hand, use a safety razor blade.

A Doctor who believed the salesman's statement that "there was no danger," bought an X-ray outfit. He had only two burns and one shock during the first six weeks. The shock killed him.

A technician went out to get his lunch, while a patient was receiving an X-ray treatment. He left her there twenty-five minutes too long. He was sorry, and his boss is sorrier (\$6,000 worth).

A radiologist who knows all there is to know, decided that it was a waste of time and money to attend the meetings of and to belong to the Radiological Society. One day a colleague asked him how he preferred to administer tetraiodophenolphthalein sodium. He did not know what the Doctor meant, and because of it lost all the referred work of a group of modern men.

—I. S. T.

ABSTRACTS OF CURRENT LITERATURE

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Deep therapy.—Because of the known fact that the same amount of input power does not yield the same amount of X-ray on different machines or with different tubes, the authors believe that dosage had better be recorded in *e*-units, the *e*-unit being that amount of X-ray (intensity \times time) which will produce 2,100,000,000 ions in 1 c.c. of dry air (under standard conditions of temperature and pressure). It can be measured easily and accurately by measuring the one electrostatic unit of electricity that those 2,100,000,000 ions will ferry across an air gap. In their work they used a galvanometer and in order to get large readings they used ionization chambers of large capacity. They carried their ionization chambers embedded in a paraffin phantom, their galvanometer and calibrating instruments to the various deep therapy laboratories of California. They supplied each laboratory with an actual X-ray intensity in *e* per minute produced at the surface of a standard phantom under a set of standard operating conditions. They also compared the filters of the laboratories. In order to apply these intensity determinations to ordinary operating conditions, it is only necessary to apply factors for distance, port-size, and thickness of filter.

F. B. SHELDON, M.D.

X-ray Deep Therapy Installations in California. W. Edward Chamberlain and Robert R. Newell. *Calif. and West. Med.*, Nov., 1925, p. 1433.

Brain tumors.—The relative frequency of cerebral tumor in adults and in children is difficult to gauge. However, statistics show that brain tumor is indeed a rarity in the first few years of life. The relative frequency increases, however, until the age of eight, after which a rather uniform level of occurrence is maintained. In regard to the localization of the tumor, it is generally conceded by observers that there exists a preponderance of subtentorial over supratentorial growths. Out of 125 cases, only 14 were classed as pituitary or suprapituitary. In other words, the more archaic and primitive areas of the brain tend to be affected by tumor-growth rather than the younger and more highly evolved telencephalon. This holds true irrespective of the histological nature of the neoplasm. As regards the type of tumor, the tuberculomata occupy the foremost place with reference to frequency of occurrence. Gliomata rank second in frequency. The sarcomata rank third. Carcinomata are very rare.

Symptomatology.—The clinical triad of headaches, vomiting and papilledema is the well-known phenomenon of cerebral tumor. Headache is perhaps the most constant feature among

the clinical manifestations. Areas of local tenderness are sometimes demonstrable upon the scalp surface. The headache is usually most severe in the early morning, waning as the day advances. It is sometimes relieved by vomiting. Sudden movements exaggerate the symptoms. In most cases the pain is constant rather than paroxysmal. An interesting feature of the headaches in children is their tendency toward spontaneous cure. The severe headache suddenly abates and leaves the patient for all time. Cessation of vomiting occurs and blindness ensues. Enlargement of the head becomes very evident. This is caused by sudden separation of the sutures of the skull, causing a decrease in intracranial pressure. Cerebral vomiting may occur without nausea, projectile in type. The "nose-rubbing" phenomenon is a very common manifestation. The reflexes become sluggish as the pressure increases. Pulse rate falls and pupils dilate.

In most cases the march of the disease is progressively downhill. In some cases one or two apparent remissions may occur. Later, after an interval of two or three years, the same symptoms re-occur; this time they usually progress to blindness and death. The phenomenon of remission is particularly characteristic of brain tumors in children.

B. C. CUSHWAY, M.D.

Brain Tumors in Children: Their General Symptomatology. Macdonald Critchley. *Brit. Jour. Children's Diseases.* Oct.-Dec., 1925, p. 251.

Bladder stones.—This is a report of a case, with roentgenograms, showing a large bladder stone with two approximately equal spherical ends united by a bar. The author concludes that such stones are formed only in connection with diverticula and as a result of chronic infection.

CHARLES D. ENFIELD, M.D.

Recurrent Dumb-bell Stone in Vesical Bladder and Diverticulum. W. Calhoun Stirling. *Jour. Am. Med. Assn.*, Feb. 13, 1926, p. 478.

Roentgen-ray effect upon blood.—After a brief review of the literature on the effect of roentgen rays upon the blood, the authors present the results of their own investigations. The number of erythrocytes is slightly decreased one to two hours after exposure, lasting sometimes over 24 hours; the hemoglobin shows very little change; the leukocyte count is always lower after treatment, the degree corresponding with the dose; the coagulation time was increased. The most uniform results were observed in following up the blood sugar; a definite raise could

be demonstrated in all cases immediately after the exposure. The hydrogen ion concentration of the blood seems to shift toward the alkaline side, lasting from one to three weeks; the sodium chloride content of the serum is decreased. No benefit has been observed from the intravenous injection of hypertonic sodium chloride solution in cases of X-ray sickness. The bicarbonate and also the alveolar CO_2 tension are sometimes decreased. These results are somewhat at variance with the findings of previous investigators.

E. A. POHLE, M.D.

The Effect of Roentgen Rays upon the Blood. E. Kolta and J. Forster. *Strahlentherapie*, 1926, XXI, 644.

Malignant disease of paranasal sinuses.—Accuracy in details is essential to proper application of radium and X-rays in the treatment of malignant diseases. Tumors of the paranasal sinuses are inaccessible to the usual surgical methods, and the literature shows very poor results. The most frequent tumor encountered is carcinoma of the antrum of the cylindrical cell type of adenocarcinoma. Squamous cell carcinoma of the antrum is usually a secondary involvement. Other types of tumors are more rarely met with—certain basal cell tumors, adenoid cystic epithelioma, cylindroma and endothelioma. Mixed spindle and round cell sarcomata of the turbinates are not uncommon. Lymphosarcoma occurs, but probably originates from the retranasal lymph tissue.

The treatment found most satisfactory is a combination of surgery, X-rays, and radium. These tumors are highly malignant and require adequate surgical exposure, secured by removing the floor and anterior wall of the antrum, for the proper application of radium. The tumor is then "planted" uniformly with radium seeds; formerly bare glass tubes giving off considerable beta radiation were used, but lately seeds made of gold tubing offering 4 mm. of gold filtration have been substituted to eliminate beta radiation.

The procedure is as follows: External applications of 200 K.V. X-rays and radium are first given to the antrum and adjacent parts. Following the external treatment capillary gold emanation tubes are introduced into the tumor through its ulcerating surface or the point of bone necrosis, and left in place. If tumor tissue is present in the nasal passage, it is treated likewise. Ten to fifteen tubes of 2 to 3 mc. each are used. Ten days to two weeks later the antrum is exposed surgically and the tumor-bearing area cleaned out, after which further radiation may be necessary. Electrocoagulation has

been found satisfactory for removal of the tumor with the least possible trauma.

Metastatic lymph nodes are treated with radium, X-rays, and surgery. All necks are radiated with short wave length X-rays. If no nodes are palpable the case is kept under careful periodical examination. If an enlarged movable node with presumably intact capsule is present on admission or appears later, the X-radiation is supplemented by radium packs and, following this, a unilateral dissection is done under local anesthesia. Radium emanation is always buried in the wound at the time of surgical dissection.

Of 100 cases treated between 1916 and the time of the publication of the paper, all but 28 cases were hopelessly advanced. Of these, 15 present no clinical evidence of disease at the time of writing. The duration of freedom from clinical evidence of disease on these 15 cases is as follows:

1 case —7 to 8 years;
1 case —4 to 5 years;
2 cases—3 to 4 years;
5 cases—2 to 3 years;
4 cases—1 to 2 years;
2 cases—9 to 12 months.

L. R. SANTE, M.D.

The Use of Radium and X-rays in the Treatment of Malignant Diseases of the Paranasal Sinuses. Douglas Quick. *Surg., Gynec. and Obst.*, April, 1926, p. 462.

Parosteal bone within muscle following trauma.—The author points out that though the appearance of parosteal bone within muscle following trauma has been known for over two centuries, yet its etiology and pathology are not fully understood. The traumatic variety follows a single severe injury and is the most frequent type. It affects the thigh and upper arm, and one form occurs after dislocation of the elbow, commonly in the brachialis anticus muscle. The condition is also seen in gunshot wounds and after clean incised wounds. The chronic variety is met with after repeated slight injuries and is found as "rider's bone" in the adductor muscles. Myositis ossificans is also seen in muscles which are the seat of a metastatic abscess and around joints affected with a chronic inflammatory process. The course may be divided into three stages. In the first, typical traumatic symptoms are present, and are followed by pain and impaired movement and increase in size of the mass. Finally growth stops and pain disappears and the mass is clearly shown by the X-ray. The condition commonly occurs in the thigh and on

the arm near to joints, and is usually seen in middle life. Conservative treatment is usually the best, unless the growth interferes with function; it has a tendency to disappear without any active intervention. In some cases simple excision of the mass may be advisable. Myositis ossificans is a reparative process within the young connective tissue originated by inflammation. It is possible that there may be a special tendency, congenital or acquired, for this excessive callus formation to take place.

Myositis Ossificans. A. Gruca. *Ann. Surg.*, Dec., 1925, p. 883. (Reprinted by permission from *Brit. Med. Jour.*, Feb. 6, 1926, p. 24 of *Epitome of Current Medical Literature*.)

Effect of roentgen rays on erythrocytes.—Holthusen's observation of a true hemolysis in blood which had been treated with a very high dose of roentgen rays induced the author to undertake an investigation of the sensitivity of the erythrocytes towards X-rays. He found that even in young animals, no direct influence of the radiation on the red blood corpuscles could be traced. He then exposed the long bones of dogs to X-rays and examined the bone marrow microscopically; control tests showed that the operation and injury to the marrow disturbed the normal cell ratio. Experiments carried out when avoiding this error demonstrated a marked influence of roentgen rays (1 S.U.D.) upon the erythropoietic system, manifesting itself in a rise of the number of immature red blood corpuscles.

E. A. POHLE, M.D.

Experimental Investigations on the Influence of Roentgen Rays upon Erythrocytes. M. D. Koolman. *Strahlentherapie*, 1926, XXI, 668.

Two types of coxa vara.—This term is now used in a broad sense to include all cases in which there is a diminution of the angle formed by the neck and the shaft of the femur, whether or not it is associated with external rotation. Two types are described, the adolescent and the congenital, the former being considerably the more common. The adolescent type shows by X-ray changes varying from a slight displacement downward of the epiphysis to a very marked displacement. Shenton's line is of diagnostic value in slight cases. Normally it forms an unbroken curve from the upper inner surface of the obturator foramen, across the lower border of the arch of the neck of the femur. In coxa vara the prolongation of the upper curve of the obturator foramen will be found to lie

below the lower border of the neck of the femur to an extent varying with the amount of deformity.

The changes in the congenital type vary from complete absence to complete development of the head and neck, with or without a fissure. There may be associated changes in the pelvis, consisting of under-development of the affected side, asymmetry and under-development of the femur.

The adolescent type occurs generally in the obese or pituitary type. Its incidence is most marked at the fourteenth year. The pituitary evidently plays an important part in the etiology.

Several cases are reported, the literature is reviewed and a series of roentgenograms are reproduced.

C. D. ENFIELD, M.D.

Coxa Varo. T. P. Noble and Emil D. Hauser. *Archiv. Surg.*, Feb., 1926, p. 501.

Combined light and heat therapy. — The author has constructed a device in which the tube through which the radiation passes is used as one of the electrodes for diathermy application. He so combines both light rays and high frequency current for treating various diseases. Clinical results are to be published in a second paper.

E. A. POHLE, M.D.

Regarding the Combination of Light and Heat Therapy. A. Steiger. *Strahlentherapie*, 1926, XXI, 696.

Congenital abnormality. — Hypertelorism is a very remarkable abnormality of the skull. In life, the peculiarities are the great breadth of the nose and wide separation of the eyes, these being secondary, however, to an unbalanced growth of the sphenoid bone. The following case history is given: Boy, aged 6 years 9 months, had had, two years before, severe fits and was admitted to St. Bartholomew's Hospital. History of birth was that of normal pregnancy. A grandfather had died in an asylum, probably of alcoholic insanity; parents healthy. Facial deformity slight. Boy is pale, with rough, fair hair, skull large and prominent anteriorly, with a keel-shaped forehead. Bridge of nose extremely broad, eyes far apart, upper eyelids droop, giving him a sleepy appearance. The fundi are normal. Strabismus is present but not conspicuous. Ears are notched. Hands large; fingers short; extremely broad, short thumbs. Feet large; toes splayed out. Deep groove around the penis and only one small testicle in the scrotum. Both inguinal canals are widely open.

Excess of fat on limbs and chest. Blood Wassermann is negative. In July, 1922, he had two major epileptic fits in one night. Since then, many attacks of *petit mal* and one of *grand mal*.

In a consideration of several such cases it is evident that this rare condition is congenital but not hereditary.

B. C. CUSHWAY, M.D.

Hypertelorism. E. A. Cockayne. *Brit. Jour. Children's Diseases.* Oct.-Dec., 1925, p. 265.

Spontaneous pneumothorax in infants. — The occurrence of pneumothorax in babies or young children is comparatively uncommon, but a search of the literature reveals a few cases. Griffith mentions the occurrence of pneumothorax as being rare in early life, but describes it as sometimes being found after pneumonia, whooping cough, measles, diphtheria, emphysema or in connection with empyema or with an abscess of the lung which has burst through the pleura. He points out that in most cases a pyopneumothorax develops. According to Sutherland the most characteristic form of pneumothorax is that following acute pneumonic processes, generally of a tuberculous character.

The case of a boy 1 year 10 months old is reported. The history recited that three weeks before he had lost his appetite, vomited, began to cough, and developed a fever. Pneumonia in the right lung was diagnosed by a doctor and the temperature was said to have reached normal three days before admission to the hospital and to have gone up again. No exploratory puncture had been performed.

On admission the temperature was 101° F., pulse 152, respiration 56. Child looked ill and dyspneic. Breathing was "inverted" in type, and the right side of the chest moved very poorly. Hyperresonant percussion note found beneath clavicle on right side, dull note below the level of the angle of the scapula on right side behind. Breath sounds distinct and amphoric in type over the right side, with occasional rather tinkling râles. Heart displaced to left. Two days later a roentgenogram showed a right pneumothorax, with collapse of the lung, except at the base, which appeared held by adhesions. Temperature came down rapidly two days after admission to 98.6° F.

A second roentgenogram twelve days later showed the lung beginning to expand again. The heart apex-beat gradually came back to its normal position. Sputum was negative upon examination for tubercle bacilli. The child was discharged after three and one-half weeks in the hospital, and was seen again as an out-patient two months later, looking very well. Heart was

normal in position and the breath sounds just a shade weaker on the right than on the left.

The favorable outcome and the negative reaction to von Pirquet's test both suggest that this case was not tuberculous in origin, but was probably caused by the rupture of the subpleural emphysematous vesicle in the course of a bronchopneumonic process in the right lung.

Although many of the cases recently recorded seem to have been tuberculous in origin, tuberculosis, especially in young children, is not a common cause.

An interesting case described by Garrett indicates another way in which pneumothorax might occur: Surgical emphysema of the whole of the trunk, neck, eyelids and scrotum followed rupture of the left bronchus just beyond the bifurcation, due to ulceration of the wall of the bronchus by a suppurating gland. Such perforation might possibly occur just inside the pleural cavity, instead of just outside, as in this case.

B. C. CUSHWAY, M.D.

Pneumothorax in Young Children: With an Account of a Case. Alan Moncrieff. *Brit. Jour. Child. Dis.*, Jan.-Mar., 1926, p. 37.

Deep therapy of asthma.—The author has seen good results in asthma cases treated by high voltage roentgen therapy. He administers 25 per cent S.U.D. (0.5 copper) over the anterior and posterior mediastinum to reach the hilum glands. Only in stubborn cases a spleen exposure (20 to 30 per cent S.U.D.) may be applied to support the therapy.

E. A. POHLE, M.D.

Deep Therapy of Bronchial Asthma. W. Bergerhoff. *Strahlentherapie*, 1926, XXI, 681.

stroma of the tumor is richly infiltrated with leukocytes. Other favorable signs are relative "unripeness" of the tumor cells, a large amount of cytoplasm with abundant vacuolation, and rich leukocytic infiltration of the tumor epithelium; these conditions, however, rarely co-exist. They find the medullary type of tumor more favorable and attach little importance to the frequency of mitoses. Formation of epithelial pearls is not discouraging if other histological criteria are favorable. Comparing the prognosis formed on histological grounds in 122 cases (before radiation) with the subsequent clinical course, Böhm and Zweifel found that they corresponded in at least three-fourths of the cases.

Prognosis in Uterine Cancer. Böhm and Zweifel. *Zentralbl. f. Gynäk.*, Jan. 2, 1926, p. 30. (Reprinted by permission from *Brit. Med. Jour.*, Feb. 13, 1926, p. 31 of *Epitome of Current Medical Literature*.)

Introducer for insertion of radon tubes.—The applicator described is a flexible lead tube just large enough to admit the radon tubes. The wall thickness is 0.75 mm. The lumen contains an obturator, with jaws on the distal end. Apparently the chief advantage is ease of insertion and freedom from the necessity for dilating or even holding the uterus with tenacula.

CHARLES D. ENFIELD, M.D.

A New Uterine Screen and Introducer for Inserting Radon Tubes into the Uterus. Frank E. Simpson and Roy E. Flesher. *Jour. Am. Med. Assn.*, April 3, 1926, p. 1005.

Irradiation of ovaries and its effect upon offspring.—The question of injury to the offspring of patients treated with X-rays or radium over the generative organs is a much discussed problem. Reviewing the literature one finds that no agreement has been reached in regard to the advisability of administering stimulating doses to the ovaries or performing temporary sterilization; the papers abstracted below demonstrate that well.

Nuernberger carried out experiments with white mice which were treated over the ovaries with very small doses shortly before ovulation. They proved that the fertility is not impaired but the germ decays before implantation in the uterus. Clinically, 126 cases have been observed so far in which normal children were born although the ovaries of the mother had been treated with X-rays or radium. In one case only, recently published, a child of Mongolian type was born to a patient who had had

a sterilization dose two years previously. The investigations of Bagg and Little are discussed in detail; criticism is raised against the conclusions that some authors have drawn from these experiments, while Bagg and Little themselves were very conservative in their conclusions. It is emphasized that the second and third generations of irradiated mice show normal offspring, and only when both parents have been treated were malformations observed in the offspring. Nuernberger himself has observed so far 104 mice of the second and third generations, showing no abnormalities whatsoever, the parents of which were treated.

Seynsche reports three cases in which he believes radiation to be responsible for the abnormal offspring. In the first case, the mother was treated two and a half years previous to the pregnancy; the child was of Mongolian type. In the second case, the father had worked for two and a half years in a roentgen laboratory. Of the three children born, two are normal, one shows signs of Mongolism. In the last case, the father had been employed in a roentgen laboratory for sixteen years; of three children, two are imbecilic, one is normal. The writer concludes, therefore, that no stimulating dose to the generative organs should be given, and no temporary sterilization carried out until this problem is definitely cleared.

Schmitt refers to the cases of Seynsche but does not believe that they offer absolute proof although they should not be disregarded. He quotes a very interesting observation concerning a physicist who has worked with X-rays since 1895 and who has a very extensive X-ray dermatitis; in 1913, one finger was amputated (epithelioma). The man has been married since 1903. An examination of the sperma in 1905 revealed the absence of living spermatozoa; from 1916 to 1919 he used perfect protection towards rays in his work, and an examination of the sperma showed living spermatozoa. His wife became pregnant in 1920, and a normal boy was born, and observation of the child for over two years has revealed no abnormality whatsoever. In conclusion, the writer states that his clinic is carrying out, as a matter of precaution, temporary sterilization only in cases of inflammatory diseases of the adnexa, and in patients with large uterine fibroids.

Penzoldt (from Wintz clinic) reviews the various opinions in regard to temporary sterilization, and states that his clinic believes that the irradiation of a pregnant woman is positively harmful to the embryo, while, on the other hand, there has not been observed a single case of true X-ray injury to a pregnancy following previous irradiation of the ovary. A recent survey of Flaskamp (135 cases) demonstrates this very

clearly. Considering the mechanism of ovulation, there should, however, be a minimum interval of at least four months before conception takes place after irradiation of the ovaries; an earlier pregnancy is regarded as an indication for evacuation of the uterus. In conclusion, it is emphasized that more detailed histories of such cases should be taken. A study of the literature reveals the fact that considerable valuable data are missing and no definite conclusions can be based upon incomplete records.

E. A. POHLE, M.D.

Regarding the Question of Injury to the Germ by Roentgen Rays. L. Nuernberger. *Strahlentherapie*, 1926, XXI, 577.

Irradiation of Generative Glands, and Offspring. Karl Seynsche. *Strahlentherapie*, 1926, XXI, 600.

Again, Regarding the Question of Injury to the Offspring after Roentgen Radiation Previous to Pregnancy. Walther Schmitt. *Strahlentherapie*, 1926, XXI, 608.

Temporary Sterilization and Injury to the Germ. Richard Penzoldt. *Strahlentherapie*, 1926, XXI, 625.

Cancer of the large bowel. — The author presents an analysis of eighty-eight cases of carcinoma of the large bowel in order to try to find some characteristic group of early symptoms which will facilitate an early diagnosis. The bearing of the pathologic structure of the different types of cancer in the large bowel has an important bearing on early diagnosis. There are, roughly, two types: one soft and vascular, which bleeds easily, ulcerates deeply, and is easily infected; the other hard, white, ulcerating only superficially, leaving a fibrous base. The former gives rise to foul, blood-stained, mucous stools; the latter gives rise to little or no blood or mucus. The former belongs to the rectum, the latter to the colon above the rectum.

The earliest symptom of cancer of the rectum is the passage of blood with the stool. This symptom alone, in the absence of hemorrhoids and fissures, should lend the gravest aspect to the case. There should be no waiting for the other signs—pain, tenesmus, muco-pus, ribbon stools.

In the cancers above the rectum the presence of blood in the stool is a late symptom, and indicates that the condition has already passed the stage of operability. A history of a rather persistent type of constipation in a person previously healthy, accompanied by occasional attacks of colicky pain—this all relieved by the evacuation of the bowels—should be the occa-

sion for painstaking search of the colon for early cancer. The special forms of examination should all be employed. But these can have no significance unless the physician who comes in contact with the patient at this early stage,—usually the general practitioner,—recognizes the significance of these early symptoms.

L. J. CARTER, M.D.

Carcinoma of the Large Bowel. Francis A. C. Scrimger. *Can. Med. Assn. Jour.*, Feb., 1926, p. 125.

Mode of action of radiation.—In this brilliant paper by Ewing, the Caldwell Lecture for 1925, the following summary of conclusions is drawn up:

"(1) The cure of carcinoma by radiation results from a nice adjustment between injury to tumor cells, assuring their partial or complete necrosis, and injury to surrounding tissues, eliciting a reactive reparative inflammation which removes tumor débris and often destroys viable tumor cells.

"(2) These tissue reactions are specific in the sense that, taken as a whole, they are not observed under any other conditions.

"(3) Effective radiation occurs only in tumor tissues which are in an approximately normal state of growth and nutrition and upon tissues which are vascular, well nourished and capable of inflammatory reaction. Dividing cells and rapidly growing tumors are more susceptible than resting cells and stable tumors, but this difference is not invariable.

"(4) The three main methods of irradiation,—the single, the fractional, and the prolonged dosage,—each produces different tissue reactions, and it is desirable that the choice of methods should be determined, as far as possible, by the character of the reaction it is desired to produce, and not merely by the therapeutic effect generally obtained. A high total dosage is the first essential in destroying most true carcinomatous processes, and as a rule the most tumor destruction and tissue reaction, and the best results, are obtained by delivering this dosage as soon as possible.

"(5) Radium probably tends to produce more specific selective effect on tumor cells, and roentgen rays more injury and reaction of the connective tissue.

"(6) The large part of the destructive effect of rays upon tumors, especially the necrosis of single cells or large masses, in bulky or encapsulated tumors, is caused by interference with the blood and lymph circulation.

"(7) Extended observations of the histological changes produced by different doses in the

different tumors must be accumulated before radiation therapy can be taken out of the field of therapeutic empiricism and rendered safe, effective, and uniform. Increased interest and importance thus attaches to the careful and thorough histological study of tumors before and after irradiation.

"(8) Effective irradiation excites a favorable reaction on the part of the body as a whole. The nature of this reaction is complex and the factors largely unknown. It is probably of much importance in the cure of malignant tumors by radiation."

Tissue Reactions to Radiation. James Ewing. *Am. Jour. Roentgenol. and Rad. Ther.*, Feb., 1926, p. 93.

The right interval for the fractional dose method.—Larvae of salamanders and mice embryos were subjected to X-ray radiation; histological studies show that the changes observed after exposure were influenced by the tissue temperature (Van't Hoff's law).

It was found that the effect of a single heavy dose may be increased by administering a number of fractional doses, the total of which is equal to one single dose, if they are given at the proper time, *i.e.*, when the effect of the exposure has subsided and a new mitosis appears in the tissue. An attempt is made to calculate the duration of the mitosis and of the primary X-ray effect in the tissues of warm-blooded animals; if the data can be transferred to human malignancies, it is advisable to give the total tumor dose in three fractional doses on three successive days.

E. A. POHLE, M.D.

The Proper Interval in the Treatment of Malignant Tumors with Fractional Doses. W. Alberti and G. Politzer. *Strahlentherapie*, 1926, XXI, 535.

Chronic abdominal pain in children.—Chronic abdominal pain or intestinal colic in children is a symptom or a disease, the etiology of which has been much discussed in pediatric literature. The surgeon has maintained that a chronic appendicitis is the cause of the recurrent pain in most instances, and appendectomy has been advised. In those cases where the appendix has been removed, more or less definite signs of an inflamed appendix are said to have been found. Physicians, on the other hand, are of the opinion that this symptom is simply an expression of the neuropathic constitution of the child, with or without pathological findings. Authors have stressed different factors as being

of importance in producing such a pain in a neuropathic child. Talbot and Brown, for instance, are of the opinion that a faulty posture has much to do with acute and chronic abdominal pain in childhood. They state that the pain is dispelled by correcting the faulty bodily mechanics. Recently Pielsticker emphasized the presence of a hepatosis, and thinks that a low-grade infection of the liver is the cause of intestinal colic in children. Also, some authors consider the abdominal pain, so often present in acute infections, to be caused by a swelling of the retroperitoneal lymph nodes. This swelling disappears, as a rule, after the infection has subsided, but may persist.

Of a series of cases observed clinically X-ray films were taken of these patients complaining of the most severe abdominal pain. Generalized colonic stasis was observed in most of the cases. After a barium enema, some dilatation of the entire colon was observed—findings thought to be due to the prolonged constipation. Constipation is described in all these conditions as a frequent symptom. Moro, for instance, mentions in his paper that 15 of his 18 cases advanced the symptoms of intestinal colic. He considers it, however, merely as a part of the symptomatology.

From the writer's material at the Pediatric Department and Clinic of the State University of Norway, it seems that this symptom—constipation—rather has to be considered as the real cause of the disease of these children. It is found that all the symptoms described, with the most essential feature, the abdominal pain, disappear quite promptly as soon as the child is given the so-called "constipation food." This food consists of whole-wheat bread and Swedish wholemeal bread, vegetables, besides some fish and meat. Enemas are given at first to aid in the intestinal return to normal.

Besides poor food, more or less bad habits often tend to produce constipation in children. The child does not take time to have bowel movements. If this is repeated day after day a condition of chronic habitual constipation results. The best results in these cases of acute abdominal pain are obtained by correcting the child's food and habits.

B. C. CUSHWAY, M.D.

Chronic Abdominal Pain in Children. Kirssten U. Toverud. *Brit. Jour. Child. Dis.*, Jan.-Mar., 1926, p. 22.

Newgrowths originating in the mediastinal glands.—The author, recording three illustrative cases, states that in the large group of intrathoracic cancers a special place must be

reserved for a peculiar variety of newgrowth which originates in the mediastinal glands, and is characterized by a very early invasion of the lung and almost exclusively pulmonary symptoms. The proof of the mediastinal origin of such tumors is supplied by their morbid anatomy, which reveals the existence of a diffuse cancerous mediastinitis invading one of the lungs by the hilum and penetrating the pulmonary substance along the peribronchial sheaths. Histological study of these growths shows that their structure, like that of malignant tumors of the mediastinum, is that of lymphosarcoma. Unlike cancers of the pulmonary hilum, in which signs of compression predominate, they do not give rise to any pressure symptoms. Mediastinal symptoms are completely absent, and the clinical picture is that of a chronic pulmonary affection, which may be mistaken for pleurisy or tuberculosis. Invasion of the lung may occur in any one of several ways. The growth may attack an upper or lower lobe in which it remains localized (mediastino-lobar cancer), or it may extend along the fissure between the lobes (mediastino-fissural cancer). The lymphosarcomatous tumors are generally of large size and rapid growth, and often give rise to multiple metastases. Sometimes they undergo softening and form cavities full of a puriform fluid which may be mistaken for pulmonary abscesses. The course is rapid, and death from progressive cachexia occurs in a few months. Association with pulmonary tuberculosis is not an exceptional occurrence.

Mediastino-pulmonary Lymphosarcoma. C. Roubier. *Rev. de méd.*, No. 7, 1925, p. 587. (Reprinted by permission from *Brit. Med. Jour.*, March 27, 1926, p. 58 of *Epitome of Current Medical Literature*.)

Iodized oil.—The history of the use of this substance in the roentgenologic study of body cavities is mentioned, initial credit being given to Sicard and Forestier. The authors began bronchial injections in 1924 and have injected more than 600 cases, with no ill effects. Four methods of using the oil are described: the supraglottic, transglottic, subglottic and through the bronchoscope. In most cases the authors have found the supraglottic method satisfactory and it has the advantage of being simpler than the others and requiring no special training. Workers are cautioned against the use of discolored oil, are advised to warm the oil before using and to warm solutions for anesthesia. They are cautioned to make exposures as soon after injection as possible.

In the supraglottic method the throat, including pharynx, velum and base of tongue, is an-

esthetized with 10 per cent cocaine on a swab. Three minutes later, 2 c.c. of 1 per cent cocaine is dropped into the glottis. Five minutes later, the injection is made under guidance of a laryngoscopic mirror, using a 20 c.c. syringe with a 6-inch curved cannula, the tip of which is held behind the base of the tongue and over the glottis. Injection is made while the patient breathes naturally. The patient is almost in the upright position for injection of the lower bronchi, being inclined slightly toward the side which it is desired to fill. The middle and upper lobes can be injected only with the patient lying down. To fill the apical bronchi, the patient is placed on a tilting table, the suspected side downward, and the head of the table is lowered a few seconds after injection.

The authors always try the supraglottic method first, except in the presence of unusual laryngeal irritability.

As a routine, both a physical examination and a roentgen-ray study of the chest are made prior to injection. One who seeks to interpret bronchial shadows must first familiarize himself with the normal. The method is most useful in visualizing bronchial dilatations and its chief therapeutic application lies in the treatment of such bronchiectatic cavities. Two cases are cited in which the symptomatology was highly suggestive of chronic pulmonary tuberculosis, the physical signs largely negative and simple roentgen-ray examination unilluminating. Injection in both these cases disclosed considerable cavities and repeated injection of smaller amounts once a week produced much amelioration of symptoms. In diagnosis, ordinarily 20 c.c. of the oil is used. Exceptionally, twice this amount may be taken care of. For therapeusis, 10 c.c. seems to be the usual dose.

It is emphasized that only a small part of the bronchial tree can be visualized at one time; that extensive local anesthesia is usually unnecessary; that the technic is not difficult; that a negative result does not prove the absence of bronchiectasis, and that injection may be hazardous in acute conditions and in tuberculosis.

C. D. ENFIELD, M.D.

Use of Iodized Oil in Diagnosis and Treatment of Bronchial Affections. Stuart Pritchard, Bruce Whyte and J. K. M. Gordon. *Jour. Am. Med. Assn.*, April 10, 1926, p. 1119.

termination of the treatment. The cases were divided into three groups. In the first group, which consisted of 32 patients with simple glandular enlargement, 26 (81 per cent) were cured. In the second group, which comprised 65 patients with glandular enlargement associated with periadenitis, 32 (49 per cent) were cured. In the third group, which consisted of 53 cases of suppurative adenitis with fistulae, 41 (77.4 per cent) were cured. The proportion of recoveries in all three groups was thus 66 per cent. Recurrence was noted in 4 per cent, and skin changes, such as atrophy and telangiectasis, were observed in 10 per cent. Amundsen is opposed to early X-ray therapy being continued for several years, as such treatment is likely to give rise to cutaneous lesions. Each series of irradiation should be distributed over a period of several days, and there should be an interval of from five to six weeks between the different series.

X-ray Treatment of Glandular Tuberculosis. P. Amundsen. *Norsk Mag. f. Laegevid.*, Feb., 1926, p. 119. (Reprinted by permission from *Brit. Med. Jour.*, April 10, 1926, p. 65 of *Epitome of Current Medical Literature*.)

Foreign body in lung.—The case reported is that of a patient, aged 33, admitted to hospital in 1921, with an empyema of the left chest. A thoracotomy was done, with a rib resection. Drainage tube inserted and in it gauze packing was introduced. This wound drained for about a year, then healed. In 1922 the wound broke down and a small piece of gauze was removed. In Dec., 1923, the patient began to cough and expectorate from 2 to 4 oz. daily of very foul-smelling material. By the middle of April, 1924, he had lost considerable weight and strength and was coughing severely.

A report from Dr. Meyers, the radiologist, was that there was a possibility of a foreign body being present in the center of the infiltration in and around the lower part of the left lower lobe. On April 26, 1924, a bronchoscopy was done under local anesthesia, and, after examination of the left main bronchus, the first ventral branch of the lower lobe was entered, and, on inspiration, about 1 cm. from its origin, a small nipple-appearing foreign body was seen in a bronchial subdivision, extending laterally. With a straight forceps, the foreign body was seized and gentle traction made, for some bleeding was anticipated. On completing the extraction, the foreign body was found to be a piece of gauze packing about 8 inches long.

The only explanation possible for the entrance of the foreign body into the bronchus is

Glandular tuberculosis.—The author made a careful examination of 150 persons who had undergone X-ray treatment for glandular tuberculosis in the Roentgen Institute at Oslo between the years 1915 and 1922, inclusive. The examination was made from two to nine years after

that it originally must have been pushed into the pulmonary tissue and gradually migrated to the bronchus.

Since the extraction, the patient has stopped coughing and expectorating, and has gained 20 pounds in weight. No further symptoms.

B. C. CUSHWAY, M.D.

Foreign Body Introduced Transpleurally and Removed via Bronchus Three Years Later. Charles J. Imperatori. *Laryngoscope*, March, 1926, p. 200.

Melanosarcoma.—The authors studied the clinical, chemical, and histological changes in the organism after irradiation of a melanotic sarcoma. While the size of the tumor remained unchanged, the pigment usually showed a decrease; there was no increase of uric acid in the urine, but pigment in the form of melanogen appeared. The microscopic examination demonstrated intact cell nuclei but a definite decrease in the amount of melanin. It is concluded from these findings that, applying the law of Bergonié-Tribondeau, the more active the cell, the more susceptible will it be to radiation; the production of melanogen must be the most active function of the melanosarcoma cells because it responds to irradiation.

E. A. POHLE, M.D.

Irradiation of Melanosarcoma. J. Borak and F. Driak. *Strahlentherapie*, 1926, XXI, 550.

Uterine hemorrhage.—The characteristic pathological picture presented by the endometrium in functional hemorrhage is described briefly, the hyperplasia of both stroma and epithelium and the Swiss-cheese-pattern observed in the sections being stressed. Accompanying, though not constant, ovarian lesions, including absence of corpora lutea, are described. Due to the fact that this type of bleeding occurs only during the reproductive period, that it commonly recurs after curetting, and that it is always curable by removal of the ovaries or by radiotherapy, these associated lesions are thought to have some causal significance.

It is emphasized that the provisional diagnosis in hemorrhage, especially in patients near the menopause, should always be cancer of the corpus until this condition can be ruled out. Drug treatment is usually ineffective and entirely useless. Very mild cases, especially in the young, sometimes tend to cease spontaneously. Diagnostic curettage should always be done and the scrapings examined carefully: first, in order to exclude carcinoma, and second, because curet-

tage itself is usually helpful and sometimes curative. Except in occasional instances organotherapy has not proven especially satisfactory. Sometimes thyroid extract may be useful. Ovarian preparations are usually useless. Posterior pituitary extract injected daily may bring about improvement.

The author considers that repeated curettage is sometimes indicated in recurrent hemorrhage in comparatively young women where it is necessary to bear in mind the possibility of future child-bearing. He admits that in certain skilled hands perhaps radiotherapy may not prejudice the chances of normal reproductive activity, but feels that where this issue is paramount it is probably better to try repeated curettage before considering radiotherapy. Functional uterine hemorrhage in patients near the menopause he considers the ideal indication for radium in gynecology, as its action is prompt and certain. Hysterectomy is mentioned as occasionally indicated where expert radiation therapy is not available, provided the abdomen must be opened for some other condition anyway.

CHARLES D. ENFIELD, M.D.

The Treatment of Functional Uterine Hemorrhage. Emil Novak. *Jour. Am. Med. Assn.*, April 10, 1926, p. 1105.

Dystrophy of the bones.—The authors record an unusual case of a woman operated on for carcinoma of the breast where the skeleton was affected with multiple and diffuse lesions not typical of metastases. One year after radical removal of the breast the patient suffered from pain in the limbs and the lumbar region. This condition became worse and the pain was very severe. The reflexes were exaggerated and the condition suggested the presence of metastasis in the spinal column, though there was no localized tenderness of the vertebrae. Radiograms showed no definite metastases, but certain diffuse lesions of the lumbar vertebrae, the sacrum, iliac bones, femora, and certain other bones. They appeared as transparent zones resembling vacuoles and suggesting decalcification of the bones.

This condition has also been noted in cases of carcinoma of the prostate where the bones have been diffusely affected, as in Paget's disease. These appearances have been regarded as pathognomonic of cancer of the prostate, and a diagnosis has been made on the radiographic appearances. The authors add that the nature of this affection of the skeleton is altogether obscure and is met with in malignant disease of the breast and prostate; in both these diseases metastasis to the bones is not uncommon. It

appears that certain types of cancer are able to produce a dystrophy of the bones from some disorder of the calcium metabolism.

Bone Dystrophy in Carcinoma of the Breast.
S. Laborde, H. Jouveau-Dubreuil, and Alice Roques. *Bull. l'Etude du Cancer*, Dec., 1925, p. 485. (Reprinted by permission from *Brit. Med. Jour.*, April 10, 1926, p. 64 of *Epitome of Current Medical Literature*.)

Rare disease of children.—This case is reported, first, because of its rarity (only eight others have been found in the literature), and, second, because thus far the condition has been observed only in children (oldest patient reported was 16 years of age). A case report is given in detail and a radiogram of the skull, showing large defects in the bone, is shown. The onset in several cases was preceded by infection of the ear, throat or mastoid, and spongy gums were found; otherwise there was no clue as to etiology. Similar defects were found in the pelvic bones. No successful treatment has been found and X-rays at a later date reveal persistence of the lesions. The bone lesions seem to antedate polyuria.

L. R. SANTE, M.D.

Defects in the Membranous Bones, Diabetes Insipidus and Exophthalmos. Bernard S. Denzer. *Am. Jour. Dis. Child.*, April, 1926, p. 480.

Surgical tuberculosis.—The author, who reports a series of 46 cases of joint tuberculosis, states that tuberculous infection in childhood is responsible for the majority of the cases of tuberculosis in adults. It is therefore important to discover the seat of the primary infection. Bone and joint tuberculosis generally arises from a primary focus elsewhere in the body, and this is most often found in the lymph nodes lying in the mediastinum. This statement, he says, is well substantiated by X-ray films and postmortem findings, and therefore an X-ray examination of the chest should always be made when there is tuberculous disease of the bones or joints. Moreover, treatment directed solely towards cure of the joint infection is only palliative, and attempts should be made to eradicate the primary focus. For this purpose radiation of the chest should be employed in those cases where enlarged lymph nodes are present in the mediastinum, as by this means the lymphoid cells are destroyed and replaced by fibrous tissue, thus simulating Nature's method of combating tuberculosis.

Keller has examined the tonsils in forty children treated for joint tuberculosis, and found

them infected in thirty-two cases. Therefore, he adds, the tonsils should always be removed when they are suspected, and, further, small buried sclerosed tonsils are often a greater danger than those of normal size, since they may increase the facility for infection because of the wider openings of the crypts and atrophy of the lymphatic tissue.

Affections of the Respiratory System in Relation to Joint Tuberculosis. Henry Keller. *Med. Jour. and Rec.*, Feb. 3, 1926, p. 169. (Reprinted by permission from *Brit. Med. Jour.*, March 27, 1926, p. 56 of *Epitome of Current Medical Literature*.)

Exostoses of cervical vertebrae.—The cases of exostoses of the cervical vertebrae occur in patients with arthritic history. In one, a woman of 74 years, there was a history of vomiting, with intestinal upset. She had blood in the vomitus. The X-ray showed two short spurs on the bodies of the fifth and sixth cervical vertebrae. Another case was that of a woman who had an exostosis of the bodies of the sixth and seventh cervical vertebrae. She complained of solid food sticking in her throat.

These cases call for very careful treatment. One is very near the edge of a tragedy in manipulating these cases.

B. C. CUSHWAY, M.D.

Exostoses of the Cervical Vertebrae as a Cause for Difficulty in Swallowing. Harris P. Mosher. *Laryngoscope*, March, 1926, p. 181.

Carcinoma of the breast.—The authors give notes of fifteen cases of operable carcinoma of the breast treated by radium and X-rays. While not advocating radiation in preference to operation in such operable cases, they point out that, since radiation has sometimes caused the disappearance of inoperable growths, it is important that radiologists should study the problems of treatment of operable breast cancers with a view to determining the best methods of radium and X-ray therapy to be adopted. From their experience the authors consider that the possibility of radiation treatment should be more freely offered to patients than is at present the case, and that they should not be told that there is no alternative to operation.

Eight of the cases here recorded were treated by X-rays, two by combined radium insertion and X-rays, and five by radium surface applications. Of the fifteen patients, one died from bronchopneumonia not connected with the carcinomatous condition and another from the disease two years after treatment had been discon-

tinued. In one there was an abdominal metastasis, but as recently as two months prior to writing ten of the patients were reported as being well, with little or no sign of disease.

A comparison of the relative value in this field of radium and deep X-rays shows no notable difference. Though the periods of observation are too short for conclusions as to technic and results, the authors think that they warrant radiation being offered to operable patients, to those who refuse operation, and to those patients for whom operation is inadvisable on account of age or some intercurrent affection.

The Treatment of Fifteen Cases of Operable Carcinoma of the Breast by Radium and X-rays. J. H. D. Webster, J. P. Thierens, and F. G. Nicholas. *Brit. Jour. Radiol.*, Feb., 1926, p. 59. (Reprinted by permission from *Brit. Med. Jour.*, April 10, 1926, p. 65 of *Epitome of Current Medical Literature*.)

Symptom of gall-bladder disease. — The author calls attention to the text-book fallacy of focusing attention on biliary colic and jaundice as cardinal symptoms of gall-bladder disease, to the neglect of such an important sign as gassy indigestion. Any chronic lesion in or about the gall bladder which is sufficient to irritate the right phrenic nerve will produce this type of flatulent indigestion.

The author bases the conclusions arrived at in this paper on sixty cases of gall-bladder disease in which he has removed the gall bladder. A study of the series showed the following group of symptoms: (1) Gassy indigestion and constipation; (2) Heart trouble, with gas in the stomach. These two groups of symptoms formed the most frequent complaints. Less frequently occurring were biliary colic and jaundice. The symptoms are produced by reflex action from irritation of the sensory nerve fibers in the wall of the gall bladder.

L. J. CARTER, M.D.

"Gassy Indigestion": Its Significance as a Symptom of Gall-bladder Disease, with a Review of 60 Cases of Cholecystectomy. A. R. Campbell. *Can. Med. Assn. Jour.*, Feb., 1926, p. 151.

Lipiodol. — The authors refer to the great advances in skiagraphy of internal organs and structures since the introduction of lipiodol. They have been very successful in studies of the respiratory tract, the nervous system, subphrenic abscess (suppurating hydatid cyst), and pericarditis with effusion. They find that lipiodol

gives perfect contrasts in the skiagrams; it is quite harmless, even in large doses, and the technic is simple. It has been reported also that it has a definite therapeutic value when injected into a purulent pericarditis or an empyema. The authors give details of the case of a man, aged 24, who had a large pericardial effusion in which tubercle bacilli were found. Lipiodol was injected many times at intervals of from five to fifteen days, and skiagrams were taken in various positions. Although lipiodol was well tolerated, it did not retard the progress of the disease in this particular case.

Lipiodol in Skiagraphy and Treatment. M. R. Castex, H. Carelli, and H. Gonzalez. *Bull. et Mém. Soc. Méd. des Hôp. de Paris*, Feb. 18, 1926, p. 217. (Reprinted by permission from *Brit. Med. Jour.*, April 10, 1926, p. 65 of *Epitome of Current Medical Literature*.)

Bronchoscopy. — Bronchoscopy is steadily gaining as a distinct aid in the recognition and understanding of obscure chest conditions. In the cases cited to demonstrate the positive value of the bronchoscope in obscure conditions of the chest, no other diagnostic agent could have given the information.

In the first two cases luetic lesions were demonstrated in the tracheobronchial tree, one of these a secondary lesion. The tertiary stage manifests itself in one of two forms: either as a gumma, or as an indurative fibrotic process, which by its endobronchial or peribronchial advance causes severe stenosis. When a patient appears with hemoptysis, cough, expectoration, and loss of weight, if he has negative physical findings, a Wassermann should always be taken. If positive, evidence of lesions in the tracheobronchial tree should be sought. Bronchoscopy should now be done to attempt to localize the suspected luetic lesion.

The first case cited had had difficulty in breathing for the previous two months, typical asthmatic breathing and frequent attacks. History of primary lesion two years before. Body covered with maculosquamous eruption. *Physical findings:* Mucous plaque on left buccal mucosa; congestion and slight edema of palatal structures; larynx the same. *Bronchoscopic findings:* Tracheal and bronchial walls seen to be seat of congestion and edema. On anterior wall of right main bronchus, about 15 mm. from the bifurcation of the trachea, an irregularly crescentic white area was seen. This could not be removed by suction, and was identical with the buccal plaque observed. Patient placed

upon antiluetic treatment, and the asthmatic symptoms immediately disappeared.

The second case reported was that of a man aged 64, whose chief complaint was shortness of breath. There was a slight non-productive cough; no hemoptysis and no loss of weight. Patient had had pneumonia fifteen years previous. *Physical examination:* Area of percussion dullness in left upper chest. Sibilant and sonorous râles were heard throughout left chest. Slight dullness on percussion of both apices posteriorly. Clinical opinion varied as follows: Asthma, neoplasm of the mediastinum, aneurysm, and tuberculosis. Roentgenographic examination confirmed the impression of tumor of the mediastinum. *Bronchoscopy:* A cauliflower mass, the size of a small walnut, was seen protruding from superior wall of the left main bronchus at the entrance of the lower lobe bronchus. The laboratory report on the section removed was squamous cell carcinoma. This neoplasm originated in one of the upper lobe bronchial branches and extended down through the main bronchial wall. The diagnosis was immediately cleared up by the passage of the bronchoscope.

B. C. CUSHWAY, M.D.

Obscure Chest Conditions, with Positive Bronchoscopic Findings; Including Two Cases of Syphilis of the Trachea and Bronchi. M. C. Myerson. *Laryngoscope*, March, 1926, p. 193.

Mercury vapor arc baths.—The author reports the result of an investigation of the effect on the blood of rather heavy single doses of light from the mercury vapor lamp, administered in cases of pseudoxalgia and certain orthopedic deformities, as well as in surgical tuberculosis. In all cases irradiation was followed by a diminution in the number of red corpuscles, but in the absence of blood volume determinations it is not certain whether this is a real or an apparent change. The reduction occurred immediately and persisted for several days, to be succeeded in some cases by a rise above the original level. The total leukocyte count was sometimes, but not always, increased, but a rise in the polymorphonuclear cells occurred, and in many cases there was a reduction in the number of mononuclear cells. Monocytosis followed in some cases, but after a few days the normal number and distribution of the cells returned. Eosinophil cells were markedly diminished, both relatively and absolutely, after the exposure, but then returned to or exceeded the original number. The sedimentation rate increased soon after exposure to the lamp and remained at a high level for some days; it was then reduced to or below the original level. As

a rule, there was an increase in the ability of the defibrinated blood to destroy staphylococci for some hours after light treatment, but this fell to the original figure in twenty-four hours, and in some cases remained subnormal for some time. Bannerman thinks it significant that these results were not obtained in patients habituated to light treatment and already pigmented, but were associated rather with the stage of erythema which is a sequel of such massive doses. He draws the conclusion that such excessive dosage is to be avoided.

Some Effects of Mercury Vapor Arc Baths upon the Blood. R. G. Bannerman. *Brit. Jour. Radiol.*, Feb., 1926, p. 71. (Reprinted by permission from *Brit. Med. Jour.*, March 27, 1926, p. 58 of *Epitome of Current Medical Literature*.)

Osseous metastasis of thyroid tissue.—Three cases of osseous metastasis of thyroid tissue are reported. In all cases, the first symptoms directed the attention to the osseous metastasis—not to the primary tumor. One metastasis was in the femur and resulted in spontaneous fracture; another was on the astragalus, and the third was on the vertebral column. A number of such cases have been reported under the heading, "Benign Metastasizing Goiter." The condition was reported first by Cohnheim, in 1876. The thyroid itself may appear normal, but the tumor tissue on the secondary metastasis shows structural characteristics of thyroid gland. From a study of the literature on the subject and from his own cases, the author has come to the conclusion that "there is abundant evidence to indicate that there is no such entity as the 'benign metastasizing goiter,' and that the use of this confusing term should be abandoned."

L. R. SANTE, M.D.

Three Cases of Thyroid Metastasis to Bones. Walter M. Simpson. *Surg., Gynec. and Obst.*, April, 1926, p. 489.

Congenital dislocation of hip.—The paper is based on 1,879 cases of congenital dislocation of the hip, embracing 2,556 dislocations. From a statistical study heredity seems to play a part in 13 per cent of the cases. The deformity is more common in females; 85 per cent were in girls, 15 per cent in boys. In 61 per cent the deformity was single; in 39 per cent it was bilateral. The author concludes that the element of heredity cannot be overlooked, but that in the main, mechanical factors are the causes of the condition in the majority of cases.

The condition, usually readily detected clinically, should always be confirmed by the X-ray.

The treatment ordinarily used by the author is the Paci method of reduction and the Lorenz method of immobilization. The results obtained have been very satisfactory. The statistics for 1913 embrace 700 cases, but show an average functional and anatomical success in 80 per cent for single and 60 per cent for bilateral dislocations.

L. R. SANTE, M.D.

Congenital Dislocation of the Hip. Vittorio Putti. *Surg., Gynec. and Obst.*, April, 1926, p. 449.

Suppurating hydatid cyst of liver. — The authors describe a case of suppurating hydatid cyst of the liver in a man aged 45. The patient suffered from violent burning pains in the stomach and right hypochondrium, vomiting, and recurrent obstructive jaundice. An exploratory puncture yielded offensive pus and gas, the latter under such tension that it forced back the piston and filled the exploring syringe. A skiagram showed a cavity below the right half of the diaphragm partially filled with fluid, which changed its position with the patient's movements. Lipiodol was injected into this cavity, and by reason of its greater density it gravitated to the lower part of the cyst, producing a deeper shadow than that of the pus, and thus indicating the lower limit of the cyst.

Lipiodol in Skiagraphy and Treatment. M. R. Castex, N. Romano, and H. Gonzalez. *Bull. et Mém. Soc. Méd. des Hôp. de Paris*, Feb. 18, 1926, p. 222. (Reprinted by permission from *Brit. Med. Jour.*, April 10, 1926, p. 65 of *Epitome of Current Medical Literature*.)

Experimental cholecystography. — The authors draw the following conclusions: The purpose of the present study has been (1) to determine the toxicity of sodium tetraiodophenolphthalein in dogs in which the liver was damaged by the use of chloroform as an anesthetic, and (2) the degree of excretion of the drug by a liver thus damaged as determined by cholecystography.

The results have shown that a moderately damaged liver does not interdict the use of sodium tetraiodophenolphthalein, for the animals with a liver so damaged tolerate the drug apparently as well as normal animals.

Because of the much smaller amount of sodium tetraiodophenolphthalein routinely used in patients (one-fourth) than used with safety on dogs known to have more or less extensive hepatic damage, the existence of presumed or obvious hepatic disease in human beings should

not necessarily preclude the employment of the drug for purposes of cholecystography in the clinic.

L. R. SANTE, M.D.

The Effect of Liver Damage on Cholecystography in Dogs by the Use of Sodium Tetraiodophenolphthalein. B. M. Fried and L. R. Whitaker. *Arch. Int. Med.*, March, 1926, p. 388.

Periodical examinations. — The author urges the necessity of a more efficient prophylaxis against tuberculosis by seeking for its earliest signs without waiting until the infection has become a disease. He points out that this can be attained only by the systematic examination of school children. At the earliest sign of under-nutrition and diminished resistance, as shown by clinical symptoms, X-ray examination, and von Pirquet's reaction, active immunization, followed by physical training, should be commenced. Periodical examination should follow so that treatment may be repeated if found necessary, and the spread of infection prevented by education and disinfection. By treating any accompanying tuberculous infection at the same time that the under-nourishment is being corrected the gain in nutrition has been more than doubled in six classes of children under observation, and Cevey argues that a method which has been found capable in three or four months of providing for tubercle-infected children in cities a state of nutrition two and a half times greater than that found among children living in the country, is deserving of attention.

The Search for a More Efficient Prophylaxis against Tuberculosis. F. Cevey. *Jour. Trop. Med. and Hygiene*, Feb. 15, 1926, p. 53. (Reprinted by permission from *Brit. Med. Jour.*, March 27, 1926, p. 55 of *Epitome of Current Medical Literature*.)

Goiter in children. — Goiter in children may be temporary and due to vascular engorgement caused by increased demand of a temporary nature, which is met by increased production of thyroxin,—not by proliferation of cells, but by increased secretory activity of each cell; this necessitates an increased blood-flow through the gland. Such goiters are small and relatively infrequent, but are met with occasionally in children with carbuncles, tonsillitis or other septic conditions. In this variety of goiter the gland returns to its normal size when the stimulus to increased secretion no longer acts.

The more common type of goiter is of a chronic nature and is due to a partial loss in

secretory power of the cells of the gland, with a consequent hypertrophy of the gland in an attempt to compensate.

Apart from disease, the demands on the thyroid vary from year to year with the growth of the body and with variations in the bodily activity, both of which will raise the metabolism. The percentage increase in weight from year to year, together with the age-incidence of enlarged tonsils, has been computed and is seen to be in a definite relationship to the age-incidence of goiter. For example, the rapid increase in weight between the ages of seven and eight corresponds with the great increase in goiter-incidence in eight-year-old children. At thirteen years there is a slight diminution in goiters, corresponding to a considerable decrease in the relative weight-increase between twelve and thirteen years.

It appears, therefore, that the cause of goiter in children may be: (1) An hereditary or early acquired diminution in secretory activity of the cells of the thyroid; (2) The relative increase in body weight causing increased need of thyroxin for metabolism; (3) Some factor which affects the tonsils in such a manner that the rise in prevalence of enlarged tonsils coincides with diminution of goiter prevalence. There is at this time no clue as to the nature of the factor.

B. C. CUSHWAY, M.D.

Observations on Goiter in Children. H. Leslie Cronk. *Brit. Jour. Child. Dis.*, Jan.-Mar., 1926, p. 32.

Tuberculous pericarditis.—The author reports the case of a phthisical patient who developed tuberculous pericarditis in March, 1925. On puncture, pus was found, which, on injection, infected a guinea pig. Two injections of lipiodol were made intrapericardially with an interval of a fortnight between them. The cardiac symptoms improved and the pericardial effusion diminished so that no further paracentesis was necessary. In June, 1925, some cerebral symptoms developed (paralysis of the sixth nerve and slight right-sided hemiparesis). The pericardial condition remained quiescent until October, when a few cubic centimeters of pus were withdrawn from the pericardial sac and 5 c.cm. of lipiodol were injected. The cerebral symptoms increased and the patient died on October 30. At the autopsy tuberculous masses were found in the brain; the pericardium was slightly adherent and contained 50 c.cm. of creamy purulent fluid; the pericardium was notably thickened. The cause of death was cerebral tuberculosis. Lemaire considers that

if the lipiodol did not cure the pericarditis, it certainly delayed its progress.

Lipiodol in Skiagraphy and Treatment. A. Lemaire. *Bull. et Mém. Soc. Méd. des Hôp. de Paris*, Feb. 18, 1926, p. 217. (Reprinted by permission from *Brit. Med. Jour.*, April 10, 1926, p. 65 of *Epitome of Current Medical Literature*.)

Carcinoma of cervix.—All cases of carcinoma of the cervix are divided into four groups: Group 1 covers the easily operable lesions confined to the cervical canal; Group 2 includes borderline cases; Group 3, the cases that are clearly inoperable. (When the disease has extended to the vaginal wall, broad ligaments, pelvic lymph nodes, etc., it is considered inoperable.) Group 4 embraces all recovering cases.

A combination of surgery, radium and roentgen rays is efficient in combating carcinoma of the cervix uteri. It is to be regretted that so few patients are seen in the early stages of the disease when the maximal response may be expected. Much depends upon the first examining physician, and he must realize his responsibility. All irregular menstrual phenomena and vaginal discharges, regardless of their character and the age of the patient, demand a most careful examination to determine the cause. Treatment should be decidedly individual, as the response of tissue is different in each case. The broken dose permits a very flexible procedure, capable of meeting the needs of the patient during the treatment. Close co-operation of all concerned, including the first examining physician, surgeon, pathologist, and radiotherapist, is essential, and it is only through such management that we can hope for good and lasting results.

L. R. SANTE, M.D.

Surgery, Radium, and Roentgen Rays in the Treatment of Carcinoma of the Cervix. Harry H. Bowing. *Am. Jour. Obst. and Gynec.*, March, 1926, p. 400.

Blood changes.—The author, who records an illustrative case, states that it is generally known that X-rays and radium may cause changes in the blood. Mottram and Clarke (1920) have shown that persons who employ radium for therapeutic purposes may present leukopenia at the end of a fortnight. Mottram has emphasized the importance of early blood examination in radiologists. Not only did he

find in many cases a diminution of the red corpuscles and a high color index, but he also observed three fatal cases, and Larkins has recorded another. In all these cases the disease ran a rapid course, death occurring in a few months. Amundsen (1924) found that the blood of radiologists differed from the normal. The total number of red corpuscles was often unusually low. The change in the blood picture, however, was most marked in the relation of the polymorphonuclears to the lymphocytes. The hemoglobin value was usually normal.

The effect of radiological work on the blood becomes distinct after one or two months, and may be observed even in the servants attached to a radium institute. The new Coolidge tube is particularly dangerous owing to the remarkably penetrating power of its rays. Lankhout's case was that of a medical practitioner, aged 34, who was director of an X-ray institute, and had been working without any protection against deeply penetrating rays. When he was first seen by Lankhout he was moribund, but he gave a history of weakness, shortness of breath, and pallor of some months' duration. Examination of the blood gave the following results: Hemoglobin, 13 per cent (Sahli); color index, 1.3; red cells, 610,000; leukocytes, 900, 52 per cent of which were polymorphonuclears and 48 per cent mononuclears. The red cells showed anisocytosis, poikilocytosis, polychromatophilia, basophil stippling, and nucleated forms.

Aplastic Anemia Due to X-rays. J. Lankhout. Nederl. Tijdschr. v. Geneesk., Dec. 19, 1925, p. 2789. (Reprinted by permission from Brit. Med. Jour., March 27, 1926, p. 57 of Epitome of Current Medical Literature.)

Emphysema of neck and chest.—The case reported is as follows: Boy, aged 2 years and 9 months, admitted to hospital, referred by Dr. J. Klepper. Three days before admission, while eating nuts, the boy laughed; this was followed by coughing attack. On day of entry he had temperature and clinical signs of a lung condition. An X-ray examination by Dr. Meyer revealed the following: An infiltrative process extending along the roots of the lungs toward the right base. An emphysematous condition of the lower right side was noted, suggesting partial obstruction in the main bronchus. The writer's examination revealed a marked subcutaneous emphysema involving the middle and both sides of the neck and extending down to the upper part of the chest anteriorly. This is the first case of this condition coming under the writer's notice and he emphasizes it as being pre-operative.

Bronchoscopy was performed. A 5 mm. Jackson bronchoscope was passed, a mass seen, and with grasping forceps three particles of nut were removed. Suction was then used and a few fragments were found in the drainage bottle. A rather stormy ten days followed, but the child recovered.

These cases of subcutaneous emphysema, Dr. Jackson tells us, have occurred in his experience. There must be a rupture of a small pulmonary vesicle, with the subsequent leakage into the mediastinum and into the tissues of the neck.

B. C. CUSHWAY, M.D.

Report of a Case of Emphysema of the Neck and Chest (Pre-operative), Following Inhalation of a Piece of Nut. Henry Hall Forbes. Laryngoscope, March, 1926, p. 192.

Experimental rickets.—The authors confirm the results of American workers on the activation of cholesterol by ultra-violet rays, but find that the time necessary for the activation is less than has been supposed. The rats with which these experiments were made were fed on corn flour, butter fat, egg albumen, calcium carbonate, and sodium chloride. The diagnosis of rickets rested on the macroscopic demonstration of the costo-chondral rosary, the histological and the radiographic examination of the bones and joints, and in some instances on McCollum's line test. The cholesterol, in a 2 per cent solution in petroleum ether, was exposed to a mercury vapor lamp running at 115 volts and 3.5 amperes for periods of 15, 45, and 60 minutes. The distance of the solution from the lamp was 30 cm. After irradiation the cholesterol was suspended as a 2 per cent solution in olive oil, and the ether driven off in a vacuum. Of this solution three drops, corresponding to 1.5 mg. of cholesterol, were given daily to each of the experimental rats; the control animals received non-irradiated cholesterol. After twenty-five days the animals were killed. The controls and the rats that had received the 60-minute irradiated cholesterol showed typical signs of rickets. The animals receiving the cholesterol that had been irradiated only 15 minutes were absolutely free from rickets, while those receiving the 45-minute irradiated cholesterol showed doubtful signs of rickets. Thus the optimum results were obtained with cholesterol which had been irradiated for 15 minutes. Irradiation in an alcoholic solution was less satisfactory. The observation was made that the irradiated cholesterol was more permeable to light of short

wave length than was the non-irradiated cholesterol.

The Prevention of Rickets by Irradiated Cholesterol. R. Fabre and H. Simonnet. *C. R. Soc. de Biologie*, Feb. 26, 1926, p. 455. (Reprinted by permission from *Brit. Med. Jour.*, April 3, 1926, p. 62 of *Epitome of Current Medical Literature*.)

Marked distortion of esophagus.—The case reported is that of a female, aged 20, admitted to New York Post-graduate Hospital and Medical School on Jan. 7, 1925, with a history of dysphagia over a period of six years. Cough, with frothy expectoration, present; fluids swallowed with difficulty; vomiting of undigested food.

X-ray report of Dr. W. H. Meyer showed that the patient had a mass in the mediastinum, with a sigmoid curve just above the cardia. Two days later, esophagoscopy was undertaken under general anesthetic, but, owing to collapse of the patient when attempts were made to introduce the esophagoscope, operation was abandoned. On January 14, 1925, esophagoscopy was accomplished, showing an extensive dilatation at the lower end of the esophagus. The cardiac orifice was not found.

On consultation it was decided to open the stomach and feed the patient through the opening. On January 30, Dr. Heyd performed a laparotomy, finding the stomach closely adherent to a chronically diseased gall bladder, with considerable fixation of the duodenum upward and to the right. The cardiac orifice seemed to be markedly hypertrophied, with more than the usual degree of spasticity. Cardiac orifice was divulsed up to three fingers, but it was impossible to perform a retrograde esophagoscopy. However, a bougie was passed from above and a black silk thread left *in situ*.

This is the first case noted by the writer in which there existed such a marked distortion of the esophagus accompanying a cardiospasm.

B. C. CUSHWAY, M.D.

Presentation of X-ray of an Interesting Esophageal Distortion. Henry Hall Forbes. *Laryngoscope*, March, 1926, p. 190.

X-rays in treatment of sterility.—The author discusses the effect of small doses of X-rays in treating sterility in women and reports in detail the case of a patient, aged 27, who had suffered from metrorrhagia since the age of 19,

and was sterile owing to functional ovarian disturbance. The uterus was small, but there was no evidence of disease or abnormality in any of the pelvic organs. Treatment of the ovaries and spleen by X-rays resulted in the cure of the metrorrhagia, and two normal menstrual periods followed. The patient then became pregnant and gave birth to a healthy child. Caufman mentions three possible explanations of this restoration of lost reproductive power as the result of X-rays, namely, stimulation of the ovarian tissue, the cure of some slight ovarian lesion, and destruction of impaired follicles, thus leaving the way open for the development of more robust follicles. He does not favor particularly any one of these theories.

He has also cured amenorrhea in a woman by administering X-rays for pruritus vulvæ, and has seen cases of pregnancy following the treatment of fibroids by X-rays.

Treatment of Sterility in Women. H. Caufman. *Paris Méd.*, Feb. 6, 1926, p. 135. (Reprinted by permission from *Brit. Med. Jour.*, April 3, 1926, p. 61 of *Epitome of Current Medical Literature*.)

Heliotherapy.—The author publishes brief records of six cases of pulmonary affections, showing the great benefits which followed treatment by radiation from a Kromayer quartz lamp. In the last fifteen years he has treated over a thousand cases of various types of disease by violet rays: 211 pulmonary; 117 sciatica; 139 varicose ulcers; 227 arthritis, and 231 cutaneous diseases. The chief effects noted were slight rise of temperature, euphoria and perspiration, improved blood pressure, increase in the number of red corpuscles, hemoglobin increased from 50 to 72 per cent, diminution in number of leukocytes, and improved general condition. In the six cases recorded either tuberculosis or a positive tuberculous skin reaction was present. It is not suggested that treatment by violet rays is a universal panacea, nor should it replace regular modes of treatment, but as a supplementary aid the author, after his experience, finds it of undoubtedly value.

The Value of Artificial Heliotherapy. G. Vigna. *Raggi Ultravioletti*, Dec. 21, 1925, p. 354. (Reprinted by permission from *Brit. Med. Jour.*, April 3, 1926, p. 61 of *Epitome of Current Medical Literature*.)

Intestinal tuberculosis.—The authors believe that with the aid of X-rays it is possible to diagnose tuberculous ulceration of the colon near the cecum much earlier than formerly. They consider that every case of pulmonary tuberculosis should be examined with the aid of a barium test meal or enema to demonstrate such evidence of tuberculosis as the too rapid passage of the meal through the inflamed areas (Stierlin's phenomenon). In tuberculous enteritis the barium passes rapidly through the large bowel, evacuation often being completed within twenty-four hours; the cecum and lower colon appear to pass the meal along as soon as

it is received. The usual haustral sacculations are lacking and the affected portions are only partially filled, presenting a ragged and irregular appearance. Occasionally the barium is delayed at the ileo-cecal valve from spasm (ileal stasis), and these pictures of hypermotility, filling defects, and ileal stasis are regarded as characteristic of ulceration of the cecum and ascending colon.

X-ray Studies of Intestinal Tuberculosis.
N. H. Blakie and A. T. Laird. *Minnesota Med.*,
Feb., 1926, p. 66. (Reprinted by permission
from *Brit. Med. Jour.*, March 27, 1926, p. 57
of *Epitome of Current Medical Literature*.)

